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# VETERINARY MEDICINE

APRIL CONTENTS 1949

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## The Chief of the B. A. I. Reports*—

A survey of the incidence of anthrax revealed 384 outbreaks in the last three years.

Coyote and wildcat were found to be immune to botulinus toxin, but mink and muskrat are moderately susceptible to types A and B and extremely susceptible to type C.

Anaplasmosis of cattle is reported to exist in 27 states. The annual loss from it is estimated to be $4,000,000, and to have exceeded $500,000 in Oklahoma last year.

Fifteen grams of commercial nicotine sulfate, 151gm of phenothiazine and 287gm of bentonite mixed and added to 44 pounds of mash removed a large percentage of the ascarids from parasitized chickens.

In a large number of four- to five-week-old chicks vaccinated against pneumoencephalitis, the loss from all causes was reduced from 27 to 12% when killed virus was used and from 35 to 7% when live virus vaccine was used.

In the treatment of roundworm infestation in pigs, sodium fluoride was given in slops, garbage and milk with poor result. The standard method, 1% of sodium fluoride mixed with dry ground feed is, as heretofore, recommended for safety and efficiency.

Research studies with beef cattle have shown weight at 15 months of age to be 76% heritable, and feed-lot gains to be 80% heritable.

The first-cross Brahman-Aberdeen Angus cattle exceeded purebred Angus in weight at six months of age, and all succeeding crosses. Cross-bred calves reached a weight of 750 from 27 to 93 days earlier than Angus calves, an important consideration in beef production.

The first cross Shorthorn-Hereford was superior to the Hereford but the best in crossbreds in both growth and carcass quality was attained in the third generation, five-eighths Hereford one-quarter Angus and one-eighth Shorthorn. All crosses were more vigorous than the purebred parent stock.

During the 1948 fiscal year 169,296 doses of *Brucella abortus* strain 19 vaccine were produced by the B.A.I. and distributed to the states in the coöperative brucellosis control project. In the same period more than 21 times this amount, 3,508,120 doses, of commercial, strain 19 vaccine was approved.

Cattle and sheep that mingle with wild deer on the coastal prairie of Texas were found to be heavily infested with the deer liver fluke, *Fascioloides hepatica*. Cattle, sheep and goats in the region are heavily infested also with the common liver fluke, *Fasciola hepatica* but deer that pastured on the same range were not infested with this fluke.

*From the Annual Report of the Chief of the Bureau of Animal Industry, Agricultural Research Administration, USDA for the year ending June 30, 1948.

# Lay Technicians in Disease Control

Acute discussions have been aroused by the announcement of the Bureau of Animal Industry that the employment of lay technicians in brucellosis, tuberculosis and paratuberculosis eradication projects is contemplated where the arrangement is satisfactory to officials of the cooperating states. Most opinions expressed on the matter have been opposed to the plan; many violently opposed. Nevertheless, the livestock sanitary authorities of 18 states have accepted the plan.

However much one may deplore this excursion to the borderline of quackery, and every veterinarian must regret it, it is idle and somewhat unjust to censure Bureau officials because of their action. The Bureau has a job to do. It is well known that it has made every possible effort to recruit veterinarians for this work, but has been unsuccessful and, as a result, has been unable in the past several years to make any progress in the disease eradication projects mentioned. This development should not have come as a surprise. It was foretold in these pages six months ago.*

This threat to the dignity of the veterinary service is of course due to the shortage of veterinarians. There are vacancies in every branch of the federal and state service that employs veterinarians. The same is true of veterinary college faculties and among veterinary practitioners in many localities. Recently a meeting of poultry processors was held in Chicago to demand of the Production and Marketing Administration that poultry inspection be entrusted to lay inspectors with veterinary supervisors, in poultry eviscerating plants. It was freely admitted the plants were entitled to inspection but despite great effort the poultry inspection service had been unable to induce a sufficient number of veterinarians to undertake the work. Pretty much the same situation obtains in the packinghouses where, at some stations, the veterinary personnel has been replaced by lay inspectors up to 75%.

Since the veterinary colleges are the sole source of recruits, responsibility for the present shortage of veterinarians is theirs.

When in 1920 the state supported veterinary schools became solely responsible for veterinary education in this country, they were unprepared for the task in buildings, equipment and faculties. So little were prospective students attracted, that they graduated but 1500 in the 1921-1930 decade, a smaller number than were graduated in 1918 alone. This number was barely sufficient to offset the normal attrition in the Bureau of Animal Industry, alone. Another decade passed before much of anything was done to enlarge existing schools or to establish new ones. Therein lies the affliction of which the use of laymen to collect blood samples and inject tuberculin, to inspect poultry processing, and to work on the killing floors in packing houses, are but symptoms. That a large part of veterinary research has fallen into the hands of scientists without veterinary degrees is but another result of an inadequate veterinary personnel. This lack of personnel for research has been a source of regret among thoughtful veterinarians for a long while.

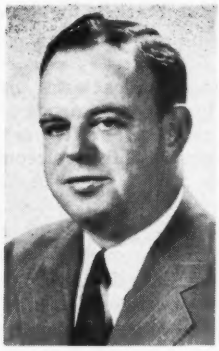
The veterinary schools, too, have an argument on their side. They are creations of our public educational system and subject to its direction. Notwithstanding seeming justification for inaction, the private veterinary colleges, in the main, had manned the veterinary profession in this country for 50 years, during a formative period when the lack of a veterinary service would have been disastrous. They did this by aggressively promoting the study of veterinary medicine, through advertising, through their faculties, through capital investments, and most of all, through active alumni bodies devoted to their cause. When this promotion vanished, student enrollment fell off 80% and that is why the veterinary profession is undermanned now and as a direct consequence, the veterinary field at the present time is being invaded or threatened by quackery on every front.

By maintaining live associations and coöperating with educators the practitioners did yeoman work in the matter of keeping non-college personnel out of their field, but in other branches of the service, encroachments not having been systematically protested, have reached a status that now threatens the very essentiality of veterinary education, and much of its dignity. And to be remembered, is that the plan to expand the veterinary service by the employment of quasiprofessionals will be a permanent development, not a transient stopgap, in fact, an enduring tragedy.

The replacement of the private veterinary colleges, 30 years ago was too sudden for the country's good. A gradual replacement would have left fewer lacunae to serve as portals for invasion of the veterinary field. "Lay technicians in disease control" is something for organized veterinary medicine to ponder when planning a veterinary service for the next cycle.

*The Entering Wedge. Vet. Med. 43:398, (October) 1948.

## Selected U. S. Veterinarian of the Year



W. A. HAGAN

**For his inspirational leadership in the veterinary profession as president of the A.V.M.A. and his constant endeavors to increase research activities, Dr. W. A. Hagan was chosen veterinarian of the year 1948 in a nation-wide poll conducted by the Gaines Dog Research Center, New York City**

Any successful disease control and eradication project must be preceded by an intensive, informative campaign to acquaint all persons involved with the facts of the disease. This calls for intensive, cooperative action between farm organizations and the veterinary profession.—*Hoard's Dairyman.*

## Veterinary Corps Conserves Air-Lift Space

Food surveillance inspections by the Army veterinary service assure that only safe, wholesome foods of good quality are presently reaching our troops and the German populations in blockaded Berlin. Perishable foods entering into the Berlin air-lift are screened for condition at the Frankfort, Germany, cold storage plant before they are hauled to the Wiesbaden air base. At the air base—a twenty-mile truck-haul away—the food is given a routine recheck during loading in the four-motor C-54's. It is in Berlin 90 minutes later.

With the continuous coordination of efforts between the Army and Air Force veterinarians, at both terminals of the air-lift, a well regulated program of food care and handling is in operation. The elimination of foods from transshipment that are poorly packaged or deteriorated and the improvisation of special packaging technics have saved an inestimable amount of air transport space. Obviously, air tonnage goals mean little if the food is unsound for human use when it reaches its destination.

Eradication of the disease [foot-and-mouth disease in Mexico] by slaughter must have been an idealistic dream of those who knew least about conditions there, but could not have been a serious consideration of anyone, after surveying the situation thoroughly.—*Ann. Rept., State Veterinarian of North Dakota.*

## Named Canadian Veterinarian of the Year

ANDREW L. McNABB

**At the 75th annual meeting of the Ontario Veterinary Medical Association, Dr. Andrew L. McNabb, Principal of the Ontario Veterinary College, was named "Veterinarian of the Year" for his outstanding contribution to the veterinary profession in managing the erection of a new wing of the main college building and his outstanding achievement in organization of the Ontario Veterinary College since he was elected to the office of principal.**

## New Name For An Old Friend

*The British Veterinary Journal* is the new name for the 74-year-old *The Veterinary Journal* which was founded in 1875 by the renowned George Fleming, M.R.C.V.S., C.B., LL.D., Principal Veterinary Surgeon, [British] Army Veterinary Department.

Of course every veterinary periodical the world over wishes for the *Journal* at least another three-quarter century of distinguished service to the veterinary profession of Britain and the Empire.

By way of comment it may be said, that while the new title is eminently fitting, seldom if ever was a more unnecessary word added to a title if the "British" is intended for identification.

More than 50% of the prescriptions filled by druggists at the present time are for products that did not exist a decade ago.

Aludrine, a synthetic drug modified from adrenalin, generally affords quick and pleasant relief for asthma sufferers, according to doctors at Johns Hopkins University Medical School.

Aureomycin, 1948's contribution to the wonder-drugs, is being acclaimed in Mexico because of its newly-discovered powers to treat the malignant form of brucellosis due to the mellitensis type organism. All of the 24 undulant fever victims treated with the golden yellow drug showed prompt improvement and Mexican physicians now count it a dependable weapon against the painful affliction which presently affects thousands of south-of-the-border residents. They're not the only ones, however. Here in the United States, the news of aureomycin is definitely good news.—*National Society for Medical Research.*

## A New Synthetic Trypanocide Produced

Great interest has been aroused in parts of Africa and in nations possessing African colonies by an announcement of the development of "antrycide" a synthetic preventive and cure of trypanosomiasis in horses, cattle, camels, sheep, swine and dogs, and perhaps in other animals. The discovery of antrycide was made by a research team of chemists and biologists in the employ of Imperial Chemical Industries (British).

In tests conducted by the researchers in Africa antrycide proved effective against *Trypanosoma congolense* and *T. vivax* in cattle, *T. brucei* in cattle, horse and dogs, *T. evausi* in camels and *T. simiae* in swine. Animals infected with these trypanosomes were cured by a single hypodermic injection of the new drug and protected against reinfection for from four to six months.

Two to three tons of antrycide will be manufactured this season; sufficient to protect 2,000,000 animals.

The possibilities opened by this discovery are scarcely predictable. It may overcome the greatest handicap to animal production in an area four million square miles in extent; most of it adapted to cattle raising. This is an area one-third greater than the area of continental United States and more than three times as great as the Argentine. It might make Africa easily lead the Americas in beef export and become the chief source of this and other animal products for the European market. Even sooner Africa could become the principal export market for American purebred livestock.

A wide range of bacterial infections are antagonized by the sulfa drugs and antibiotic agents, but none are effective against the smaller viruses. Only aureomycetin and chloromycetin are of value in the treatment of rickettsiae infections—Rocky Mountain spotted fever and Queensland (Q) fever.

At Pennsylvania State College research workers have discovered a substance in the blood of a large milkweed bug which inhibits the organisms that produce common boils, and the staphylococci responsible for food poisoning. The report adds that other insect juices show germ-fighting powers.

Nitrofurazone is said to possess the following advantages as a remedy for coccidiosis in chicks: (1) less toxic than sulfa drugs, (2) costs less than one-half as much as sulfa drugs and (3) highly effective against coccidia. It is also probably effective against pullorum disease.—*Poultry Digest.*

Current medical periodicals record with increasing frequency the seemingly favorable effects in the handling of chronic brucellosis by the concomitant use of streptomycin and sulfadiazine. At least results have been sufficiently encouraging up to this time to justify further attempts in the employment of this combined form of chemotherapy.

DFDT, a German cousin of DDT, has been undergoing tests on fish and animals at the U. S. Public Health Service laboratories. The apple-scented insecticide does an especially capable job of killing houseflies—better in fact than Nobel-prize-winning DDT. Furthermore, DFDT is less toxic to warm-blooded animals than its celebrated cousin.—*National Society for Medical Research.*

In 1928, Dr. Alexander Fleming of St. Mary's Hospital, London, England, discovered the presence of a substance in one of the common blue-green molds that prevented the growth of certain bacteria. Since the mold belonged to the genus Penicillium he named the bacteriostat "penicillin" and called it a day. Thirteen years later Dr. H. W. Florey in Oxford learned of Fleming's discovery and proceeded to do something about it.

## Brucellosis Ring Test

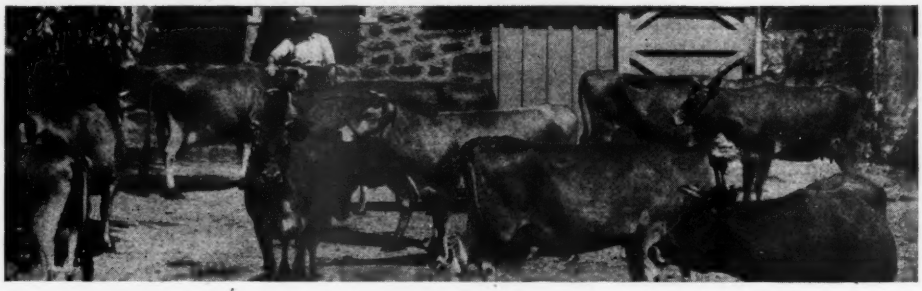
A dozen years ago a brucellosis test, known as the ABR (abortion bacillus ring) test was developed in Germany. It quickly came into use in the Scandanavian countries but the outbreak of World War II soon disrupted plans for brucellosis control. Since the war the test has come into wide use in those and other European countries. In this country where the first object of our brucellosis control plan was, until recently, to kill cows, and limiting the spread of infection was distinctly secondary, the "ring test," as it has come to be called, found no favor until last year when a co-operative study of it was undertaken by the University of Minnesota and the federal Bureau of Animal Industry. It is early yet for definite conclusions but those conducting the test believe, as do European authorities, that the test is a valuable adjunct to other measures in the control of brucellosis. If further experience confirms preliminary findings, it may well make possible eradication of the disease.

The test is very simple. A stained antigen is added to a pooled sample of the milk of several cows and held at room temperature for 1.5 hours. If there is an infected animal among the group the antigen is carried to the top of the sample of milk with the rising cream; bringing the color (blue) with it and thus forming a blue "ring" in the test tube when viewed from the side. The milk below the cream is left a natural white. If there are no reactors in the group the cream rises white leaving the milk below a light blue.

The technic consists of collecting up to 5cc samples in a test tube from each can of milk brought to a creamery or milk station on the day of the test. Two drops of stained antigen is then added to each sample which is held, examined and interpreted as stated. With slight modification cream may be used for the test.

Limitations of the test are: (1) it is less accurate than the blood test for an individual animal, (2) it is not always satisfactory as a herd test, *i.e.* if for example the milk of a single reactor is mixed with that of a large number of nonreactors the dilution may be so great as to prevent a reaction. Best results are attained in groups of four to eight cows, hence samples are taken from each can as delivered to the processing plant. (3) The test is not adapted to milk that has been frozen or to collostrum. It does not reveal infection in the herd bull nor in nonlactating cows. Infection in the latter may be found by repeating the test in six months.

Two outstanding advantages of the ring test are apparent. (1) It affords a speedy, inexpensive method of locating infected herds. The former will appeal to the disease control authorities and the latter to the forgotten man *i.e.* the taxpayer. (2) It will appeal to the dairyman since it will avoid bleeding clean herds.



*Courtesy Jensen-Salsbery Laboratories*

It is estimated that the cost of area testing an average county will not exceed one-tenth of the cost of testing the same area with the blood test alone. An advantage to the dairyman is the opportunity it affords him to have his herd tested at any time he suspects infection may have been brought into it, instead of having to wait, perhaps months or years, for the reaccreditation test. Much spread of infection may be prevented by this early location of disease foci.

But probably the greatest advantage to be derived from the ring test is the facility it affords for locating the herds in which calf vaccination is most needed. By a program of vaccinating every heifer calf in every infected herd, spread of the infection can be stopped in months. With this accomplished eradication of the remaining infection in the herds could be pursued more deliberately. Until spread of the infection has been stopped there is no hope of eradicating this disease.

# A Case of Brucellosis in a Veterinarian

Brucellosis is regarded by the U. S. Public Health Service as one of the important infectious diseases in the United States. The number of cases occurring annually has been estimated at 40,000. The reported cases number about 4,000.

There seems to be agreement, however, that veterinarians are more often and more intensely exposed to this disease than persons of any other vocation. Certain it is that each year many veterinarians contract the disease and a much greater number acquire a hypersensitivity to Brucella organisms that induces pain and irritation following contact.

Such noted authorities on human brucellosis as Evans, Spink, Eisele and others state that physicians recognize only a minority of the cases they see; that the majority are diagnosed as some other disease. In view of this and the great exposure to Brucella infection entailed in the work of the veterinarian, it is appropriate that the veterinarian know something of the symptoms that his own case, if he contract the disease, be not overlooked by his physician.

The following case, in a veterinarian, was reported by Charles Leroy Steinberg, M.D. (*J. Am. Med. Assn.*, 138, pp. 15-19, 1948).

M. C., a veterinarian aged 30, was first seen in December 1946. The onset of the present illness began in the summer of 1941. The first symptoms noticed were headache, undue fatigue and leg aches. He would arise in the morning feeling rather well. A few hours later aches would start in the legs and would be associated with a mild degree of fatigue. Moderate headache would start late in the afternoon and would become intense by night. The leg aches and the degree of fatigue would increase decidedly as the day progressed. The patient himself suspected brucellosis in that he had been working in herds of cows in which the degree of brucellosis infection was as high as 50%. He admitted coming in contact often with infected material from the placenta of aborting cows. The cutaneous test for brucellosis was markedly positive in result. Agglutinating titer was positive, 1:40, on May 10, 1941 and 1:160 on May 12. The symptoms of fatigue, leg aches and headaches continued for two weeks and were unassociated with fever. These symptoms recurred yearly. He consulted an eye physician on several occasions because of the severe headaches. He was informed on each occasion that nothing was wrong with his vision.

The next change in his clinical picture occurred in March 1946, at which time he had pain in the left "hip" on and off for a period of two months. Chills and fever were first noted in April. This febrile phase lasted for eight days. Agglutination for *Brucella abortus* and reactions to cutaneous tests were positive. The symptoms subsided completely after eight days and the patient felt comparatively well until August, at which time he experienced pain in the left "hip," the region of the coccyx and in the right upper quadrant of the abdomen. These symptoms gradually subsided in one month. The next recurrence was in November, at which time severe pain developed in the left sacroiliac area. He was treated with brucella vaccine in dilution of 1:10 subcutaneously. Each injection was followed by a severe reaction of pain in the left sacroiliac area. Whirlpool bath treatment of the lower extremities and heat locally to the left sacroiliac area aggravated the condition. He had to use crutches the latter part of December owing to severe pain in the left sacroiliac area. Examination on December 20 revealed a well developed, well nourished white man whose nude weight was 164½ pounds (74.6kg), height 5 feet 11 inches (180.3 cm), standard weight 166 pounds (75.3kg), temperature 98.6° F., pulse rate 76 and blood pressure 100 systolic and 70 diastolic. The pupils reacted to light and accommodation. Tonsils have been removed. Roentgenograms of the teeth and gross appearance of the teeth and gums were negative. The posterior part of the pharynx appeared innocent. Examination of the neck, lungs, heart and abdomen revealed no abnormality. Normal motion was present in all joints, but there was extreme tenderness over the left sacroiliac area. The knee jerk on the left side was diminished as compared to the right side. Sensation to heat, cold, pain and touch was normal.

The urine was normal. The red blood cells were 5,710,000, the hemoglobin 16.9gm, the white blood cells 9,750. The Schilling differential count revealed stabs 6, segmented cells 60, lymphocytes 20, monocytes 4 and eosinophils 3%. The sedimentation rate was elevated at 25mm per hour. The upper limit of normal by this method is 10mm per hour. The blood uric acid was normal at 3.4mg per hundred cubic centimeters. Throat culture revealed a rare *Streptococcus viridans* organism. Agglutination for *Brucella abortus* was positive in a titer of 1:320. Five localized areas of healed scars measuring 4mm by 4mm in diameter were present on both forearms as a result of the vaccine that the patient had received some weeks previously. These indicated the severe nature of reaction that the patient had to the B. abortus vaccine. Roentgen examination of the lumbosacral revealed the following: "Lumbosacral spine: There are five lumbar vertebrae. The alignment of the bones is good, with a normal degree of lumbar lordosis. The intervertebral disks, centra and intervertebral articulations are well visualized and appear normal. Lumbosacral articulation is normal.

"Definite destructive changes are noted in the left sacroiliac joint with loss of definition of the articular margins and a definite oval area of destruction of the bones near the upper border of the joint, which measures 1cm in diameter. Widening of the joint space of the left sacroiliac joint is also evident at its lower margin and there appears to be definite destruction of the articular surfaces in this area. The sacrum and coccyx are otherwise normal. The hip joints are normal.

"Radiographic conclusions: The findings are those of destructive changes in the left sacroiliac joint. This lesion is probably secondary to a bacterial infection and may be consistent with brucellosis involving the joint."

The patient was treated symptomatically and with complete bed rest. The symptoms gradually subsided under this management until Jan. 14, 1947. A shaking chill of 1.5 hours' duration de-

veloped, and his temperature rose to 104° F. on this date. This episode was repeated on Jan. 15, 1947. On the latter date streptomycin was started. He was given 0.5gm of streptomycin intramuscularly every three hours. An initial blood culture was negative, and agglutination for *B. abortus* which was taken this day and reported two days later was positive in dilution of 1:640 titer. A palpable spleen was felt on January 16 and January 17. Rose spots not unlike those of typhoid appeared on the abdomen on the later date.

The initial response to streptomycin appeared encouraging. However, it must be remembered that the patient had a similar episode of chills and fever 10 months previously and had no streptomycin. The temperature chart was almost identical. That is, the temperature dropped to normal in a period of approximately three days. In spite of this, it must be emphasized that four days' medication with streptomycin in a person who has had *Br. abortus* infection over such a long period of time is not a fair clinical trial. The reason for stopping the streptomycin in this case was the severe local inflammation in the buttocks produced by the injections. The patient refused to take any more streptomycin. On Feb. 9, 1947 he again began to have a low grade fever (100 to 101° F.) in the afternoon, indicating that the disease was still active. It should be emphasized that the patient felt symptom-free while at complete bed rest and at no other time.

A further description of symptoms is pretty much a repetition of what has already been detailed. A discussion of differential diagnosis in this disease by Doctor Steinberg is interesting but need not be repeated here.

This case is recounted in considerable detail to again warn veterinary practitioners of the seriousness of Brucella infection. Here is a report of a veterinarian who suffered intermittently for six years from brucellosis and toward the end was completely incapacitated and required hospitalization. It was not till January 27, 1947 that his principal incapacitating involvement, the pain in the sacroiliac region, was even suspected of being due to the Brucella infection.

The case is not an isolated one. It could be duplicated many fold. No other persons are so frequently, it might be said, so constantly exposed to *Br. abortus* as the veterinarian in dairy practice yet, commonly, the hazard of infection is treated with complete indifference. This case illustrates one result. A more frequent result is the development of a sensitivity to the organism that precludes further participation in bovine obstetrics or sterility work—an important part of dairy practice.[1]

[1]*Vet. Med.* 43:494, (December) 1948.

Since this report was published much improved methods of treating brucellosis in man have been developed. Of its treatment with a combination of sulfadiazine or sulfamethazine, orally, and streptomycin parenterally, Dr. W. W. Spink and associates of the University of Minnesota Hospitals say:[2] "The results were more satisfactory than had been obtained with any other form of therapy up to that time."

In the first group of patients (nine) treated with this combination, several suffered severely from streptomycin toxicity. In the second group the dosage of streptomycin was much reduced. This rendered the therapy less effective. The dosage finally arrived at, and which is now recommended, is:

Give streptomycin, 0.5gm, every six hours for 14 days—thus giving a total of 28gm.

Give three to four grams of sulfadiazine at the initial dose and then continue with 1gm every four hours for at least 14 days and in some cases for 21 days or one week after discontinuing the streptomycin.

At this level of dosage, the author concludes, only one patient has shown a reaction to the streptomycin—a dermatitis on the 8th day. However, in two other patients the fever continued for 14 days and disappeared suddenly when the streptomycin was discontinued in the normal course of treatment.

The treatment is regarded by the authors as being satisfactory in both acute and chronic cases, including two cases with bone involvement.

The efficacy of this combination in the treatment of brucellosis applies only to the abortus type. In cases in Mexico city, due to the melitensis type of the organism, it had to be abandoned because it was both ineffective and highly toxic.[3]

In the Mexico cases, aureomycin was substituted for the streptomycin, with spectacularly favorable results.[4] Improvement of the patient was so prompt and so great that it was deemed to be due to the aureomycin alone and the use of the sulfadiazine was discontinued. Also the aureomycin is effective when given orally and hospitalization is not required as is the case with streptomycin. Administration of aureomycin is commenced at 0.1gm per dose at six-hour intervals and rapidly increased to 0.5gm so that the patient receives 2gm daily. Recovery was usually apparent in two to three days but, unless medication is continued considerably longer, relapses may occur.

[2]Spink, Wesley W. *et al.* 1949. Treatment of brucellosis with streptomycin and a sulfonamide drug. *J. Am. Med. Assn.* 139:352-356 (February 5).
[3]*J. Am. Med. Assn.* 138:1145, (December 18) 1948.
[4]*Vet. Med.* 44:138 (March) 1949.

# B. A. I. Regional Research Laboratory

**Left: Administration Building, Regional Animal Disease Research Laboratory, Auburn, Alabama**

**Below: The buildings photographed from the air. The building at the left with the circular drive in front is the Administration building. The other buildings are laboratories and animal quarters**

The Regional Animal Disease Research Laboratory, Auburn, Alabama, was established in 1937 under the Bankhead-Jones Act, at the request of the agricultural experiment station directors of the 13 Southern States.

Representatives of the states and U. S. Department of Agriculture selected Johne's disease (paratuberculosis), internal parasites of cattle, and coccidiosis of cattle as problems to be studied.

The station comprises 40 acres, deeded by the Alabama Polytechnic Institute to the U. S. Department of Agriculture, adjacent to the School of Veterinary Medicine. It is a regional research laboratory for studies of the mechanism of infection in the contagious, infectious, and parasitic diseases of domestic animals and poultry and methods of control, in cooperation with the 13 state agricultural experiment stations in the region.

The original director was Dr. B. T. Simms, now chief of the Bureau of Animal Industry. The present director is Dr. A. H. Groth.

Results of research on the three projects have been reported in some 45 publications. Various staff members have contributed to the programs of national, regional, state, and local meetings of veterinary and other scientific groups as well as meetings of livestock producers.

The adrenal glands from 20,000 cattle are required to make one pound of adrenaline.

Estrogen occurs in the urine of pregnant cows but not in the urine of pregnant ewes, goats, sows, bitches and cats.

Two thirds of the meat produced in the United States is raised west of the Mississippi River—two-thirds of it is consumed east of that river.

The pancreas of eight million cattle and 45 million swine are required to fill the annual insulin requirements of the 2,500,000 diabetic persons in the United States.

It is reported in South Africa that the blue tick *Boophilus decolaratus* has apparently developed a tolerance for benzene hexachloride and are not killed on cattle which are dipped in that insecticide.

So far as known, anaplasmosis has occurred in but one herd in Indiana—a herd of feeder steers. When the condition was recognized. The 40 remaining animals were sent to slaughter, where 19 were condemned.—C. R. DONHAM, D.V.M.

Thirty rumenotomies for traumatic gastritis in dairy cows and 24 recoveries was the experience of Dr. Robt. Nichols in 1948. Etiologically speaking nails and pieces of wire tied, scoring 15 cases each.—*The Maine Veterinarian.*

Hyperkeratosis occurred in seven herds in Indiana in 1948. In one herd of 185 cattle, the mortality from this disease was 135. This loss and the loss of condition in animals that recovered aggregated $25,000, according to the estimate of the owner.—C. R. DONHAM, D.V.M.

Eradication of the parasite responsible for the transmission of cattle tick fever has returned to the people of the South untold millions of dollars and made possible a prosperous cattle industry in a large area of our country in which this was not possible previously.

Of a lot of 108 cattle slaughtered at the Cudahy Packing Company in Denver recently 76 carcasses were so badly bruised that the necessary trimming resulted in a loss of $1200. Dr. W. T. Spencer, who examined the carcasses, said most of the damage resulted from overcrowding at loading and unloading shutes.

Vomiting is an unfavorable symptom in cases of internal injury in dogs, whether it occurs early or late.

Don't suture bite wounds in dogs. Tell the owner that tissue injury is far greater than is apparent, and that the wound will look worse in four or five days.—C. D. Barrett, D.V.M.

For the second year in succession the (British) National Greyhound Racing Association has contributed $40,000 for research to the canine section of the Animal Health Trust.—*Brit. Vet. J.*

The health department reports that 12,500 persons were bitten by dogs in Chicago in 1948. The postmaster reports that mail carriers were bitten 4700 times, which would seem to indicate that only a minority of dog bites are reported to the health department. The police shot 445 dogs.

There has not been a case of rabies in dogs in St. Louis County (Missouri) for two years. In 1943 there were 382 cases reported to the health department; in 1944 234 cases. Two factors are credited with complete suppression of rabies in the county: (1) vaccination of a large percentage of the owned dogs by the veterinary practitioners of the district, and (2) constant alertness in picking up ownerless dogs and strays.

The number of cases of rabies in Summit County, Ohio increased from year to year, reaching 218 in 1945. At that time, the veterinarains in the county initiated a rabies control program. No quarantines were proclaimed, but through all publicity channels dog owners were urged to have their pets vaccinated, and to get rid of strays. There was one case of rabies in the county in 1947, in an unvaccinated dog recently brought into the county, and no cases in 1948.—C. D. BARRETT, D.V.M.

Dislocation of the elbow in dogs is common as a result principally of automobile injuries. Because of the heavy muscles attached to the ulna, getting the humerus back into place is usually very difficult without complete relaxation of these muscles. This relaxation is not readily accomplished by barbiturate anesthesia, but may be accomplished easily by first giving an average dose of nembutal and then fatiguing the muscles with a Gordon extender. After stretching the muscles for 15 to 20 minutes with this apparatus, the bones are easily slipped into place when the elbow is acutely flexed.—WADE O. BRINKER, D.V.M.

# Comments Upon Animal Health Factors

By R. R. DYKSTRA, D.V.M., Manhattan, Kansas

In some European countries where foot-and-mouth disease is indemic much of the time, the first observed symptom of the disease is said to be soiling of the nose and muzzle. This is because soreness of the tongue causes the animal to forego the usual cleansing of the parts.

* * * *

Ingram and Hauge in the November, 1948, number of the *Norsk Veterinaer-Tidsskrift* discuss the presence of bacteria in the flesh of Norwegian fin whales. They state that 24 hours after this mammal's death there were large numbers of bacteria spread widely in the flesh, and that the vigorous production of gas is characteristic of the principal organisms present. Staphylococci and molds, which are usual contaminating organisms, were markedly absent. One fact clearly emerging from the results is that "it is incorrect to regard whale meat as sterile, even if prepared under perfect hygienic conditions."

* * * *

An inquiry recently came to our desk from a veterinarian engaged in an extensive rural practice, in which he raised the question of swine lungworm persistence in some hog lots. He indicated that more than a year ago some hogs in these lots became rather badly infested; and after lying idle for a year, other hogs turned into these lots were also infested. We called our correspondent's attention to an article that appeared in 1938 from the pen of L. A. Spindler, U. S. Bureau of Animal Industry, in the Proceedings of The Helminthological Society of Washington. In the article Doctor Spindler again calls attention to the fact that the earthworm is the intermediate host for the lungworm. He collected earthworms from a farm where no hogs had been kept for four years, and the location of the lot precluded the possibility of fecal contamination from adjoining farms. He found that out of a total of 75 sexually mature earthworms examined, 35 (46.6%) were infested with lungworm larvae. This means that susceptible swine are likely to become infested with lungworms if they are placed in such lots in less than four years from the time infested were removed. Of course all veterinarians know that the ingestion of earthworms by swine can be reduced by keeping the animals away from manure piles, old straw stacks, and rubbish; also by draining low places and plowing lots frequently. Feeding the hogs an adequate protein ration and ringing them is helpful.

* * * *

The Registration and Horse Identification Departments of the Jockey Club have decided that the long-known words "near" and "off" are to be dropped in favor of "left" and "right." The word "sock" to describe white to the fetlock is banned, though "stocking" is again approved for white extending above the fetlock.

* * * *

Almost all veterinarians know the answer when the farm wife complains that cream does not rise on her dairy milk. There may be more than one answer, but usually it is due to the unusual dominance of rennin-producing bacteria so that "sweet curdling" results before the cream has a chance to rise. Ordinarily the acid producing bacteria rule out the rennin producers but sometimes the latter gain the upperhand—result, no cream. Some of these rennin-producing bacteria are spore-producers so that they become firmly established in the milking utensils—they're heat resistant. Therefore in the cleansing of these utensils use fine steel wool, plenty of soap powder or wetting agent, and finally keeping submerged in boiling water for at least 15 minutes.

* * * *

The identification of race horses is now on a reasonably good basis. There are two systems in vogue. One administered largely by the Pinkerton Detective Agency, aided by field men and veterinarians, concerns itself with a general description of the animal such as color, markings, age, weight, height—all to be accompanied by photographs, and specifically by full-sized photographs of all four chestnuts, as it is contended that in no two animals are these anatomical structures identical. The other method of equine identification is a system of tattooing. Uniquely-designed dies, under the control of the Thoroughbred Racing Protective Bureau, are used so that a five-digit number in indelible ink is imprinted on the undersurface of the upper lip. Urine and saliva chemical tests for almost any of the numerous agents used as stimulators—"doping" the layman calls it—are almost routine at the leading tracks.

*Courtesy Allied Laboratories*

**CEDAR COUNTY IOWA IN 1914**

**Caps and turned-up collars show the setting is not Mexico, and "slickers" reveal the on-lookers are not visitors but grim workers. During the disastrous slaughter program in Mexico it was not unusual for 500 to a thousand persons to visit a killing and mingle with the cattle and goats awaiting slaughter. When returning home if they didn't take infection with them it wasn't for lack of opportunity**

## Foot-and-Mouth Disease Advisory Committee Satisfied with Progress

The Secretary of Agriculture's Research Advisory Committee on foot-and-mouth disease in a meeting January 19th, with Dr. B. T. Simms, Chief, Bureau of Animal Industry, and the Bureau's technical staff concerned with foot-and-mouth disease in Mexico, expressed satisfaction with progress of the control and eradication program of the Mexican-United States Commission.

All members of the committee have recently visited Mexico and have had the opportunity to review the program at first hand. Those attending the meeting included Gen. R. A. Kelser, Dean of the School of Veterinary Medicine, University of Pennsylvania; Dr. W. A. Hagan, Dean of the New York State Veterinary College, Cornell University; and Dr. R. E. Shope, Department of Animal Pathology, Rockefeller Institute. Dr. J. Traum, Professor of Veterinary Science, University of California, remaining member of the committee, was unable to attend because of illness.

### Vaccine Production

A progress report on production of vaccine in Mexico was presented to the committee by Dr. L. O. Mott, who with Dr. Francisco Camargo directs the vaccine production division for the Mexican-United States Commission. Doctor Mott also brought up for discussion problems faced by the Commission in testing vaccine for potency, duration of immunity after vaccination, and technical difficulties faced in the manufacture of the vaccines.

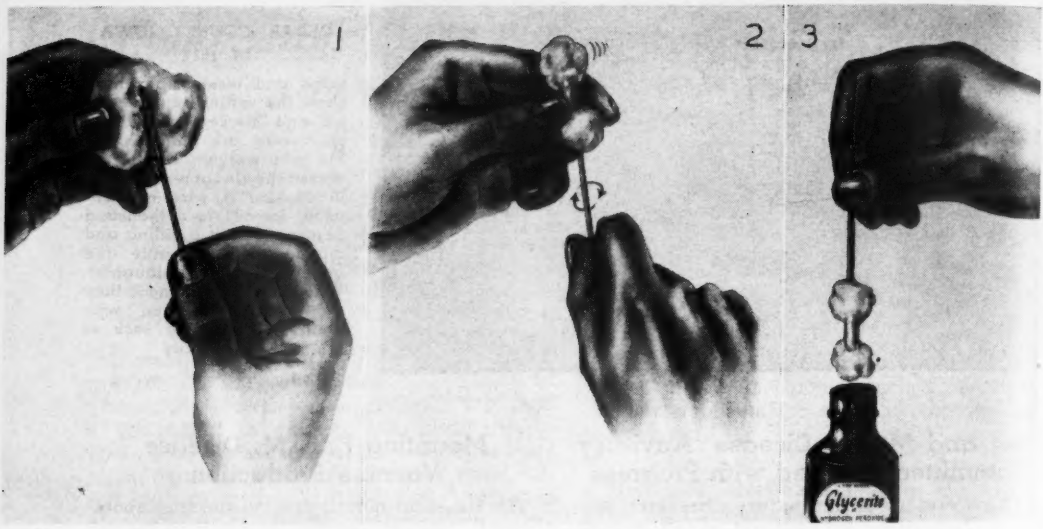
The Research Advisory Committee reaffirmed the need of a long-range research program on foot-and-mouth disease in this country, as the Mexican program has brought to surface many gaps in technical knowledge of the disease and means of controlling it.

## Mounting F. & M. Disease Vaccine Production

The foot-and-mouth disease vaccine laboratories in Mexico continue to pile up new records in the production of vaccine. Vaccine production was started in a small way in May, 1948, but not until September was quantity production achieved. In that month 630,000 doses were manufactured. October production was 1,060,000 doses; November 1,350,000 doses; December 1,750,000, and in January 2,400,000 doses were produced.

There is a six-week lag between manufacture of the vaccine and its use owing to the rigid requirements for testing. A total of 750,000 animals were vaccinated by December 4, 1948, but by the end of January more than 4,500,000 animals had been vaccinated. As a result the quarantine lines have four times been moved toward the center of the infected zone. This reverses the movement of these lines before the vaccination program was adopted.

Reports of the rapidly increasing production and use of foot-and-mouth disease vaccine is the best news that could come out of Mexico. The sole hope of eradicating the disease from that country lies in the vaccination of all susceptible animals in the infected territory which, when the extension of the disease was stopped and turned back by vaccination, included 18 of the 28 states in Mexico and the *Distrito Federal* in which the city of Mexico is located. It is difficult to set a date when eradication will be complete. The present plan contemplates vaccination of the 15 million animals in the infected zone three times in the next 18 months. It is believed this will accomplish eradication. Further narrowing the infected zone may reduce materially the number of animals to be vaccinated and hasten the completion of the work.




# A New Technic in Treatment of Abscesses

By JAMES EMMERSON, D.V.M.
North Quincy, Massachusetts

A number of papers have appeared in the literature recently attesting to the efficacy of glycerite of hydrogen peroxide in the treatment of cutaneous and mucous membrane infections.[1,2,3,4] The solution of glycerite of hydrogen peroxide has been shown to be nontoxic and non-irritating as demonstrated by patch tests on a significant number of human beings.[5] *In vitro* tests have demonstrated the bactericidal potency of glycerite of hydrogen peroxide for both gram-positive and gram-negative organisms and also for aerobic, anerobic and spore-forming organisms.[6]

Clinical studies of four separate series of patients suffering from chronic purulent otitis media treated with glycerite of hydrogen peroxide with carbamide have demonstrated its markedly curative effect in this condition.[7,8,9] Glycerite of hydrogen peroxide when used in the post-operative treatment of anorectal infections[10] reduced healing time approximately 50%. As a tampon, solutions of this drug have cleared vaginal infections in one or two applications.[11]

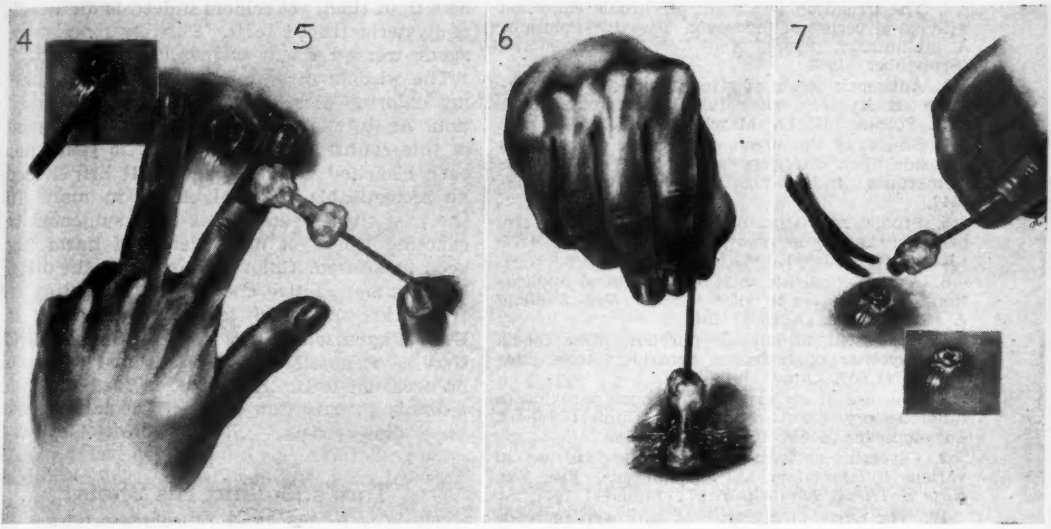
Since glycerite of hydrogen peroxide is an anhydrous solution and possessed of hygroscopic properties, its application to open wounds draws plasma to the surface. The hydrogen peroxide is liberated upon contact with the catalase of damaged or infected tissue. The oxygen produced by the peroxide decomposition is trapped by the glycerol and churns the solution. This action which occurs at the wound surface causes new antibacterial material to be in continuous contact with the interface of the wound until all of the peroxide content of the solution has been used. The residual solution containing 8-hydroxyquinoline and glycerol maintains its antibacterial and antifungal effects for some time. The separate ingredients can be ingested without harm.[6]

As used in the treatment of more than 1,000 surface infections of small animals, patients of the Emmerson Animal Hospital, the use of the solution has resulted in markedly successful antisepsis and healing in otitis, abscesses, granulas, abrasions, lacerations, denuded areas, pustular dermatitis, preputial inflammation, hock and pubic infections, burns, pyorrhea, stomatitis, and alveolar osteitis.[12]

The methods of treatment were varied and comprised instillation by dropper or syringe, topical application by brush, irrigation, wet dressing, gauze plugs, and gauze swabbing. In all of the series no instance of irritation or toxicity was observed although repeated applications were made at the same site.[13]

During the course of the clinical application of glycerite of hydrogen peroxide,* we developed a new technic for the post-operative treatment of abscesses. This technic was used in the treatment of 55 cases of maxillary

*The glycerite of hydrogen peroxide in 2.5% strength for this clinical work was supplied by the International Pharmaceutical Corporation, 132 Newbury Street, Boston, Massachusetts.




abscesses and 41 cases and anal gland abscesses. Anaerobic bacteria were present in substantially all of these lesions.

The new technic is described in detail and is also illustrated by the sketches numbered 1 to 7 inclusive:

1. A tampon is prepared by the use of an ordinary long round stick applicator. Dry sterile surgical cotton is applied to the end of the applicator, the stick being permitted to penetrate the cotton to a depth of approximately one inch.

2. The cotton is twisted at its mid area onto the stick which results in a flaring of the cotton at both ends. The mid portion where twisted thus becoming firmly attached to the stick applicator.

3. The tampon prepared as indicated is immersed in the solution of glycerite of hydrogen peroxide for the few seconds required for the surgical procedure.

4. The abscess is incised. The incision can be very small because of the hygroscopic properties of the solution to be applied.

5. The incision is slightly spread to permit the insertion of the saturated tampon.

6. The tampon is then inserted directly into the incision to its mid area.

7. The tampon is cut off above the surface of the skin permitting the upper portion of the tampon to protrude from the incision. This allows an opening for drainage and also permits removal and changing of the tampon with complete facility.

A new saturated tampon is applied every 2-4 hours in order to keep fresh solution in contact with the incised lesion at all times during treatment. The frequency of application is determined by the amount of exudate or pus in the abscess. It will be observed that following the first application, a profuse bubbling peroxide action occurs. As the infection subsides in subsequent applications the bubbling diminishes in intensity and amount, and as the infection clears and the abscess decreases in size, the bubbling may completely cease. The tamponage is discontinued at this point and wet dressings are applied using glycerite of hydrogen peroxide. Granulation soon appears. No apprehension need be felt in the use of the solution since it is entirely free of harmful effects even when ingested. The duration of treatment of this type of infection has in the past required eight to 10 days. With the use of glycerite of hydrogen peroxide the hospitalization period has been reduced in each case to four to six days.

With the absence of pus and quick decongestion, clean healthy tissues usually appeared in all cases within two to four days after the initiation of treatment. It was observed that the oxidizing action of the solution brought about a remarkable antibacterial effect, particularly where anaerobic bacteria were present. Further studies describing the use of glycerite of hydrogen peroxide in the treatment of cyst infections will be reported on in the near future.

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5. Studies on tissue tolerance to a new glycerol peroxide antiseptic solution. *Ann Allergy* 4:33, (January-February) 1946.

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## Agene Bleaching Prohibited

The U. S. Food and Drug Administration has removed nitrogen trichloride gas from the list of approved bleaching agents for bread flour. Flour bleached by this agent (agene process) cannot move in interstate commerce after 1949. It is likely that chlorine dioxide will be the bleaching agent used.

It has not been determined that "agenized" flour is harmful to persons, but because of its toxicity for dogs and some other mammals and the fact there are other equally efficient bleaching and aging agents, the use of nitrogen chloride has been banned until more information as to its effect on man and animals has been developed. Already more than a year ago the baking industry began to switch to other agents for bleaching and aging flour.

Agene flour has been used in the United States for 25 years, but now that it is suspect it is alleged to cause stomach ulcers and neurological disorders. Sir Edward Mellanly, nearly three years ago, discovered that agene-treated wheat flour causes convulsions in dogs, when it constitutes the principal ingredient in the diet.

A dozen years ago it was common to hear of outbreaks of fright disease or hysteria in dogs blamed upon dog biscuits, however the consumption of dry dog food is much greater now than then, yet seldom indeed is an attack of hysteria traced to it. Possibly more than agene-treated wheat is involved.

The wisdom of banning agene and endorsing chlorine dioxide is open to serious question. As stated nearly all white flour consumed in this country during the past 25 years has been bleached with this agent. It has caused no recognizable harmful effects in man. In the past three years it has been subjected to exacting tests, yet no evidence of harm has been uncovered. Chlorine dioxide on the other hand is more active chemically than nitrogen trichloride and much less is known about it. Even if agenized flour is harmful to dogs (and that is accepted with reservations) there is no occasion to incorporate it in feed for that animal. Justification for the FDA action rests on a flimsy basis.

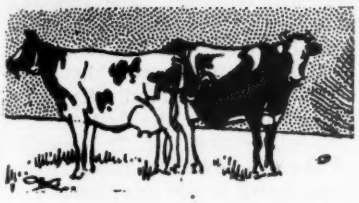
## That's Calling His Shots

There were 308 cases of rabies reported to the Indiana State Board of Health in 1946, and 382 cases in 1947. At the annual meeting of the Indiana Veterinary Medical Association in January, 1948, R. A. Fagan, D.V.M., Veterinary Epidemiologist of the Indiana State Board of Health, predicted there would be a large increase* in the number of cases in 1948. The number for 1948 was 817.

## Functions of Roughage

Dairy cows or other ruminants depend on their roughage primarily for carotene or vitamin A. The other essential vitamins, with the exception of D, are either not required in appreciable amounts by the ruminant or else they are synthesized in the rumen. Top grade dehydrated alfalfa hay may contain as much as 90 milligrams of carotene per pound, one pound of which will supply all of the carotene a 1,000 pound cow needs daily for liberal milk production and reproduction. Average suncured alfalfa hay will contain about 8 milligrams of carotene per pound or a daily allowance of 10-12 pounds will be required to supply the carotene needs of a 1,000 pound cow for reproduction. The average good grass hay will usually contain not more than 4 or 5 milligrams per pound, thus requiring approximately 20-25 pounds daily to meet the 1,000 pound cow's needs. Over-ripe grass hays, cottonseed hulls, straws, and even dried pasture grasses contain no measurable amounts of carotene, hence they cannot be depended upon to supply any appreciable amount of the essential carotene for good health and reproduction.—(Purina) *Nutr. News Bul.*

**Vet.Med.* 43:295-298 July, 1948.



# Complement-Fixation Test for Serum Diagnosis of Bovine Anaplasmosis

By WILLIAM M. MOHLER*, D.V.M.; ERVIN A. EICHHORN*, V.M.D.; and HERBERT ROGERS*, B.S., Scientific Aide

Washington, D. C.

THE control and eradication of anaplasmosis of cattle are hampered by the fact that there is no readily available test, other than inoculations, for the detection of animals affected with the chronic type of the disease—the so-called carrier animals. Available information indicates that an animal once infected with anaplasmosis remains a carrier of the causative agent for a number of years. During this time the animal may show no symptoms whatsoever of the infection; however, it is a constant source of further spread of the disease.

Attention has been given to the development of a reliable laboratory test for the diagnosis of the disease in its chronic form. Some success was obtained by Rees and Mohler[1] in the diagnosis of anaplasmosis through the complement-fixation test, in which infected ticks were used in the preparation of antigens. Many difficulties were encountered in preparing suitable antigens and for this reason the work was discontinued. Recently the subject was again studied and fresh impetus to the problem was given by the report of Kent and Rein[2] on the serum diagnosis of malaria in human patients by means of the complement-fixation test. Using the technics reported by Kent and Rein with some modifications, the present authors have obtained very encouraging results in the diagnosis of anaplasmosis in cattle through the complement-fixation test. It is the purpose of this paper to report briefly on these results.

The antigens used in the Bureau's experimental work were prepared at its Animal Disease Station at Beltsville, Maryland. The methods of the preparation of the antigen are described in the paper by Mott and Gates[3] The antigen, well iced, was brought to the Pathological Laboratories in Washington, D. C., in the liquid state and there lyophilized. The various reagents used in the complement-fixation test were carefully standardized, and a large number of samples of sera from acute and chronic cases of anaplasmosis with known histories, as well as a large number of sera from normal animals, were tested.

## General Outline of Procedure

The complement-fixation test is carried out as follows, the various reagents being combined in the amounts indicated.†

1. The blood serum of the bovine to be tested is usually preserved with 0.5% of phenol or 1:10,000 merthiolate solution. As some bovine sera have a tendency to be anticomplementary, in all instances one part of serum is mixed with nine parts of buffered saline solution and inactivated in the water bath at 58° C. for 35 minutes. The serum dilution for test purposes is used in 0.05, 0.1 and 0.2cc amounts.

2. Lyophilized antigen is prepared from the blood of a splenectomized calf after inoculation with anaplasmosis, as described elsewhere in this journal by Mott and Gates.

Tests of its antigenic, anticomplementary and nonspecific properties are then made to determine its optimal dilution, and 0.2cc of the optimal dilution are used.

3. The complement, which is contained in the fresh blood serum of healthy guinea pigs, is pooled after about 25 of the animals are bled. This serum is immediately frozen in ampoules and stored at —70° C. until used in the test. Complement is thawed and immediately titrated before each test in the water bath at 37° C. for 30 minutes. The amount of 0.2cc (4-50% units) is used in the test proper.

4. The unit of amboceptor or hemolysin used in this test is 0.2cc of the highest dilution of anti-sheep rabbit serum giving complete hemolysis of 0.2cc. of a 2% suspension of washed, packed sheep cells in the presence of 0.2cc of 1:100 dilution of complement after incubation in the water bath at 37° C. for 30 minutes.

*Pathological Division, Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture.

†More specific details for each step of the test will be furnished upon request.

5. In preparation for use in the hemolytic system, sheep blood is collected aseptically in an equal volume of modified Alsever's solution and stored in bottles in the ice box. The amount required for any test is removed in a sterile manner and washed three times in a calibrated 15.0cc centrifuge tube with buffered saline. After the last washing, cells are packed as usual for quantitative volume determination and a 2% suspension is made. Equal volume of this suspension and an optimal dilution of amboceptor in the amount of 0.2cc of each are mixed 10 minutes before use in the test. The final volume for all titrations and tests is made up to 1.0cc with buffered saline solution.

## Experimental Results

The sera from the anaplasmosis experimental herd at Beltsville, Maryland, consisting of 20 carrier animals and 24 normal animals, were subjected to the complement-fixation test for anaplasmosis each month throughout the year. Approximately 90% of the serum samples drawn from these animals gave reactions in accordance with the history of the animal, whereas approximately 10% gave discordant reactions. The latter were especially noted in serum from several of the carrier animals. One of the animals in the herd was a known carrier of the disease with a consistent record of strongly positive reactions to the test over a period of three years. In the subsequent monthly tests of the herd, the serum from this animal gave definite negative reactions, which have been consistently observed to the time of writing this report. A subinoculation of the blood from this animal into a splenectomized calf was made in an effort to determine its carrier state with respect to anaplasmosis. No reaction was noted in the inoculated calf at any time. As a further critical test, the animal in question was splenectomized. No thermic, parasitic or other reaction indicative of anaplasmosis was observed during a period of 60 days following splenectomy, indicating that the animal had lost its carrier state and substantiating the negative reaction of the serum of this animal to the complement-fixation test.

It was also possible to obtain samples of serum from animals before infection and after artificial infection and to make tests of the daily bleedings from these animals, For example, a splenectomized calf was inoculated with 500cc of blood taken from an acute case of anaplasmosis. Samples of blood were taken from this calf before inoculation and at daily intervals afterward. In the sample drawn before inoculation, the complement-fixation reaction was negative and remained so until the 12th day after inoculation. On the 13th day a 2+ reaction was obtained. The following day the sample gave a 4+ reaction and held this reaction until the death of the animal six days later. Anaplasms in the red blood cells of this animal were not observed microscopically until three days after the first reaction to the complement-fixation test. In a number of tests, a positive reaction to the complement-fixation test was noted before anaplasms were seen microscopically in the red blood cells.

A total of 10,198 samples of cattle blood have been tested. These samples were obtained from animals in several experimental herds with known histories and also from herds on farms in states where anaplasmosis is known to exist. There has been exceptionally good agreement between the complement-fixation reaction and the known histories of animals in the several experimental herds. Serum samples received from several state university experimental herds infected with anaplasmosis had been tested on several occasions, and the results of the test coincided with histories of the animal in the herd. Results of the test in several states where anaplasmosis was known to exist indicated a wider distribution of the disease than has been suspected heretofore. For example, of 509 herds tested from one state, 58 (11%) contained reacting animals. Of 7,225 samples of serum, 225 (3%) reacted to the test. Suspected reactors were noted in 95 cases. In another state 753 samples of serum were tested, 20 of which gave positive reactions and 12 were suspect.

During the last year several universities and one foreign government have been supplied with serum and antigen for check testing in their laboratories. Additional work is going forward in field-checking the accuracy of the test through animal inoculation. The results of the test are highly encouraging, and it is hoped that other laboratories will be in a position to carry on this work so that the reliability and practicability of the test as a means of detecting carrier animals affected with anaplasmosis may soon be determined.

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# Blood Concentrations Following the Administration of Sulfamerazine and Sulfamethazine to Cattle*

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Elizabeth K. Tillson, A.B. and Alice A. Pitt, A.B.
Glenolden, Pennsylvania

COMBINATIONS of sulfonamides for the treatment of infections are currently of great interest to members of the medical professions. Studies by Lehr[1] and Frisk[2] with various sulfonamide compounds have shown that there is a reduced chance of renal toxicity in small experimental animals and in humans when mixtures of sulfonamides, rather than one or another of the components, are given. In their studies it was shown that $N_1$-heterocylic derivatives of sulfanilamide are soluble in saturated aqueous or urine solutions of each other approximately to the extent of their individual solubilities in water or urine, respectively.

Also, it has been reported by Lehr[3],[4] that mixtures of sulfonamides are more effective therapeutically than are the individual compounds given separately.

In these studies we have made observations of the blood plasma concentrations of the sulfonamides following the oral and intravenous administration of a combination of sulfamerazine and sulfamethazine** to young cattle.

In one experiment, we made certain blood examinations in a search for evidence of toxicity. In this test a dosage schedule was followed that probably would be excessive for ordinary clinical use.

## Procedure

A group of 12 young cattle, four to 10 months of age, including members of the Jersey, Guernsey, Hereford, Angus and Shorthorn breeds was used. Their weights ranged from 195 to 385 pounds.

The animals were maintained in a comfortable barn, each tied separately in a stall. Whole and rolled oats, mixed hay and drinking water were accessible to them at all times. The experiments were conducted in the months of May, October and November.

Thirty milligrams of sodium oxalate per tube was used as the anticoagulant in the blood samples that were taken for sulfonamide determinations. In every instance the sample was centrifuged, and the plasma separated from the cells immediately following the bleedings. Free and total sulfonamide determinations were performed according to the method of Bratton and Marshall[5]. No attempt was made to differentiate between the two drugs in the unknown samples. The samples were read against a sulfamerazine standard curve and the results have been expressed as sulfamerazine. Therefore, the results reported are slightly lower than would be the case for total sulfonamide, since the molecular weight of sulfamethazine is slightly higher than is that of sulfamerazine.

Heparinized blood samples were used for hematology and blood chemistry studies.

## Experiment I

Purpose: The purpose of this experiment was to determine the rate of excretion of the sulfonamides from the blood following a single intravenous dose.

### Material and Methods

A sterile solution containing 5% sulfamerazine and 5% sulfamethazine was given to six animals by gravity through a 15-gauge needle into a jugular vein, as a single dose at a dosage of ½ grain per pound (approximately 0.075gm/kg) of body weight.

Blood samples for the determination of free sulfonamide were collected at 1, 4, 8, 12, and 24 hours after the intravenous injections. The results are recorded in chart I.

## Experiment II

Purpose: To demonstrate the safety of large daily intravenous doses and to determine the free and total blood plasma concentration of the sulfonamides.

### Material and Method

A sterile solution containing 5% sulfamerazine and 5% sulfamethazine was given once daily for five days to each of four animals.

*From the Medical Research Division, Sharp and Dohme, Inc. Glenolden, Penna.

**"Merameth" is the term used by Sharp and Dohme, Inc. to identify the preparation containing sulfamerazine and sulfamethazine.

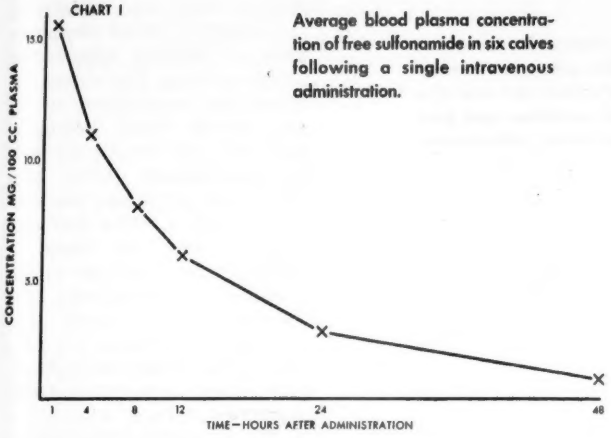
TABLE I—BLOOD VALUES AND SULFONAMIDE CONCENTRATION DURING CONTROL, DRUG AND POST-DRUG PERIODS IN FOUR CALVES.

| Date | Animal No. | Creatinine mg/100cc plasma | N.P.N. mg/100cc plasma | W.B.C. per cc | R.B.C. per cc | Hemoglobin gm/100cc blood | Drug expressed as sulfamerazine mg/100cc plasma | |
|---|---|---|---|---|---|---|---|---|
| **CONTROL PERIOD** | | | | | | | | |
| 10/13 | 71 | 1.20 | 28.0 | 7,400 | 9,750,000 | 17.3 | | |
| | 72 | 1.30 | 31.0 | 5,680 | 7,990,000 | 12.6 | | |
| | 74 | 1.00 | 26.0 | 12,880 | 10,230,000 | 14.9 | | |
| | 75 | 1.30 | 31.0 | 8,200 | 8,790,000 | 12.5 | | |
| 10/14 | 71 | 1.00 | 30.4 | 6,440 | 10,640,000 | 17.1 | | |
| | 72 | 1.20 | 37.8 | 7,240 | 9,190,000 | 13.2 | | |
| | 74 | 0.90 | 26.0 | 12,520 | 9,270,000 | 12.5 | | |
| | 75 | 1.22 | 39.0 | 7,280 | 9,010,000 | 12.4 | | |
| 10/15 | 71 | 1.10 | 26.0 | 7,160 | 10,720,000 | 17.8 | | |
| | 72 | 1.20 | 29.0 | 5,560 | 9,180,000 | 13.6 | | |
| | 74 | 0.90 | 27.0 | 12,080 | 10,040,000 | 14.0 | | |
| | 75 | 1.20 | 32.4 | 8,640 | 10,750,000 | 13.0 | | |
| **DRUG PERIOD** | | | | | | | 24 hrs. after daily dose | 1 hr. after daily dose |
| 10/18 | 71 | | | | | | | F—22.0<br>T—22.7 |
| | 72 | | | | | | | F—34.8<br>T—36.4 |
| | 74 | | | | | | | F—30.4<br>T—32.0 |
| | 75 | | | | | | | F—31.6<br>T—33.1 |
| 10/19 | 71 | | | | | | F— 7.7<br>T— 8.5 | F—33.2<br>T—34.7 |
| | 72 | | | | | | F—10.0<br>T—11.1 | F—31.2<br>T—32.0 |
| | 74 | | | | | | F— 5.6<br>T— 6.4 | F—31.6<br>T—34.2 |
| | 75 | | | | | | F— 5.6<br>T— 6.5 | F—33.2<br>T—34.4 |
| 10/20 | 71 | | | | | | F— 9.4<br>T—10.0 | F—36.1<br>T—57.2 |
| | 72 | | | | | | F— 9.7<br>T—10.8 | F—40.6<br>T—42.5 |
| | 74 | | | | | | F— 6.1<br>T— 6.9 | F—31.6<br>T—33.7 |
| | 75 | | | | | | F— 8.6<br>T— 9.0 | F—36.0<br>T—37.1 |
| 10/21 | 71 | 1.20 | 36.4 | 6,640 | 10,560,000 | 16.8 | F—10.3<br>T—11.1 | F—35.2<br>T—37.1 |
| | 72 | 1.30 | 34.2 | 8,080 | 9,180,000 | 12.2 | F—13.1<br>T—14.5 | F—39.6<br>T—41.6 |
| | 74 | 1.24 | 33.0 | 11,600 | 9,730,000 | 13.1 | F— 6.3<br>T— 7.0 | F—32.0<br>T—33.7 |
| | 75 | 1.32 | 38.2 | 9,000 | 8,890,000 | 10.8 | F— 7.4<br>T— 8.4 | F—34.8<br>T—36.9 |
| 10/22 | 71 | 0.90 | 32.4 | 5,600 | 9,800,000 | 16.1 | F—10.7<br>T—11.3 | F—33.7<br>T—34.7 |
| | 72 | 0.98 | 37.8 | 6,400 | 9,150,000 | 12.7 | F—13.1<br>T—14.5 | F—41.6<br>T—42.5 |
| | 74 | 0.84 | 34.4 | 12,000 | 9,480,000 | 12.9 | F— 6.4<br>T— 7.0 | F—31.3<br>T—31.6 |
| | 75 | 1.20 | 39.0 | 8,600 | 7,650,000 | 10.1 | F— 7.2<br>T— 8.0 | F—34.3<br>T—34.4 |
| **POST-DRUG PERIOD** | | | | | | | | |
| 10/26 | 71 | 1.26 | 30.0 | 8,040 | 10,140,000 | 15.7 | | |
| | 72 | 1.30 | 35.0 | 9,040 | 9,120,000 | 11.5 | | |
| | 74 | 1.10 | 32.8 | 10,240 | 9,890,000 | 12.2 | | |
| | 75 | 1.26 | 38.2 | 8,160 | 6,900,000 | 10.9 | | |

F = Free sulfonamide mg/100cc plasma T = Total sulfonamide mg/100cc plasma

The injection was made with a 15-gauge needle by gravity into a jugular vein. The dosage was one grain of combined sulfonamides per pound (approximately 0.15gm/kg) of body weight.

CHART I




Average blood plasma concentration of free sulfonamide in six calves following a single intravenous administration.

Blood samples for the determination of sulfonamide concentration, cell-counts, hemoglobin, creatinine, non-protein nitrogen (N.P.N.) and the icterus index were collected during control, drug and post-drug periods.

The results are recorded in table I and chart II.

### Experiment III

Purpose: To determine the rate and degree of absorption and the maintenance of blood concentrations of sulfonamides following the oral administration of the compounds in suspension.

### Material and Methods

A suspension containing equal parts of sulfamerazine and sulfamethazine, and 0.5% tragacanth, was given in a single dose as a drench to each of 12 animals. The dose of the sulfonamides was one grain per pound (approximately 0.15gm/kg) of body weight.

Blood samples for the determination of sulfonamide concentrations were collected at 1, 2, 4, 8, 12, 24, 36 and 48 hours after drenching with the suspension. The results are recorded in table II and chart III.

### Experiment IV

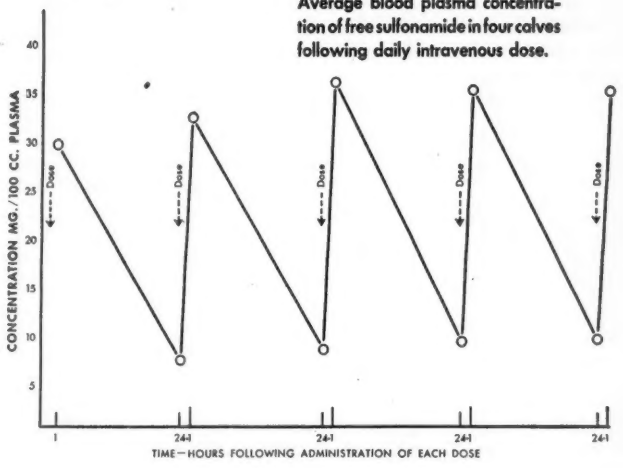
Purpose: To determine the rate and degree of absorption and the maintenance of blood concentrations when sulfonamides are given once daily, in tablet form for four days in two different dosages.

### Material and Methods

A compressed bolet containing equal parts of sulfamerazine and sulfamethazine, together with an excipient were given orally, once daily for four days to six animals. Dosage of the sulfonamides was ½ grain sulfamerazine and ½ grain sulfamethazine per pound (total approximately 0.15gm/kg) of body weight on the first and second day. On the third and fourth days the dose was reduced so that each animal received ¼ grain sulfamerazine and ¼ grain sulfamethazine per pound (total approximately 0.075gm/kg) of body weight.

Blood samples for the determination of sulfonamide concentration were collected 12 and 24 hours subsequent to each dose of the compounds.

CHART II




Average blood plasma concentration of free sulfonamide in four calves following daily intravenous dose.

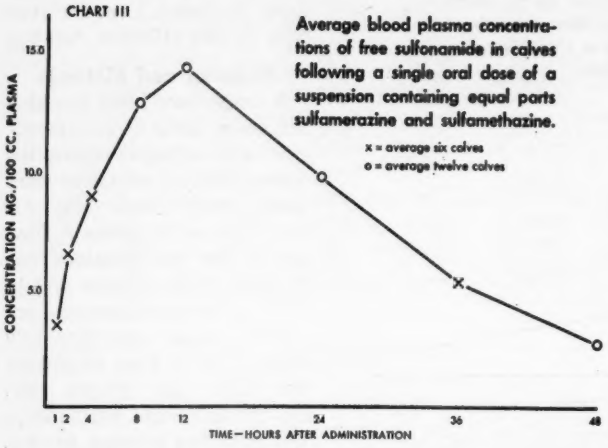
The results are recorded in table III and chart IV.

### Discussion

In Experiment I, it was determined that following a single intravenous dose of ½ grain per pound (approximately 0.075gm/kg) of

body weight of equal parts of sulfamerazine and sulfamethazine, the average blood plasma concentration of free sulfonamide (expressed as sulfamerazine) fell from a maximal value (at one hour after injection) of 15.7mg per 100cc of plasma to 2.8mg per 100cc at 24 hours after administration.

CHART III


Average blood plasma concentrations of free sulfonamide in calves following a single oral dose of a suspension containing equal parts sulfamerazine and sulfamethazine.
x = average six calves
o = average twelve calves
CONCENTRATION MG./100 CC. PLASMA
15.0
10.0
5.0
1 2 4 8 12 24 36 48
TIME—HOURS AFTER ADMINISTRATION

This would indicate that an appreciable blood level can be obtained and maintained for a period of 12 hours following a relatively low dosage. Such a procedure would be very beneficial as the initial treatment for severely sick animals or for those that are difficult to medicate orally.

Experiment II was conducted to determine whether rather large dosages of a combination of sulfamerazine and sulfamethazine injected intravenously once daily for five consecutive days would cause any serious toxic manifestations, as judged by blood examinations or physical appearance of the animals. The values for creatinine, nonprotein nitrogen, icterus index, hemoglobin, and cell counts as well as sulfonamide (free and total) concentrations are given in table I. The sulfonamides caused no apparent serious toxic reactions so far as could be determined. The average blood values appeared to be within the normal range during each phase, since they agree with those given as normal values for cattle by Coffin. The icterus indices for all blood samples collected were within normal ranges.

The average concentration of free sulfonamide (expressed as sulfamerazine) was 29.7mg per 100cc one hour after the first dose and an average peak concentration of 36.1mg per 100cc of plasma was observed one hour after the third dose. The lowest average concentration of free sulfonamide, 7.2mg per 100cc, was observed 24 hours after the first dose. Succeeding blood samples collected 24 hours after dosage had a slightly higher concentration of free sulfonamide.

According to these data, it is evident that

TABLE II—BLOOD PLASMA CONCENTRATION (MG/100CC, AS SULFAMERAZINE) IN 12 CALVES FOLLOWING AN ORAL DOSE OF A SUSPENSION CONTAINING EQUAL PARTS OF SULFAMERAZINE AND OF SULFAMETHAZINE AND 0.5% TRAGACANTH.

| Interval after Adm.-Hrs. | Calf | Calf #13 | Calf #14 | Calf #15 | Calf #16 | Calf #17 | Calf #18 | Calf #71 | Calf #72 | Calf #73 | Calf #75 | Calf #76 | Calf #77 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F | | | | | | | 4.0 | 3.7 | 3.6 | 3.4 | 3.4 | 3.1 | 3.5 |
| | T | | | | | | | 4.5 | 4.2 | 3.9 | 3.7 | 3.8 | 3.4 | 3.9 |
| 2 | F | | | | | | | 6.8 | 5.8 | 6.2 | 6.0 | 7.0 | 6.0 | 6.3 |
| | T | | | | | | | 7.3 | 6.2 | 6.2 | 8.1 | 7.3 | 6.3 | 6.9 |
| 4 | F | | | | | | | 9.5 | 9.0 | 7.9 | 9.3 | 9.6 | 8.6 | 9.0 |
| | T | | | | | | | 9.8 | 9.3 | 8.2 | 9.9 | 10.1 | 8.9 | 9.4 |
| 8 | F | 12.5 | 14.8 | 14.8 | 10.0 | 13.9 | 9.9 | 15.0 | 12.5 | 14.4 | 10.7 | 11.3 | 13.3 | 12.7 |
| | T | | | | | | | 15.8 | 12.8 | 14.7 | 11.3 | 12.0 | 15.1 | 13.6 |
| 12 | F | 14.5 | 15.0 | 14.5 | 10.8 | 17.0 | 12.0 | 12.4 | 15.8 | 11.8 | 14.9 | 16.2 | 15.6 | 14.2 |
| | T | | | | | | | 12.9 | 16.7 | 11.9 | 15.9 | 17.5 | 15.6 | 15.1 |
| 24 | F | 10.1 | 13.0 | 8.7 | 8.2 | 13.4 | 9.4 | 8.9 | 9.0 | 8.5 | 8.2 | 9.9 | 10.8 | 9.8 |
| | T | | | | | | | 9.3 | 9.7 | 9.0 | 8.7 | 10.3 | 11.2 | 9.7 |
| 36 | F | | | | | | | 4.7 | 5.3 | 4.0 | 4.1 | 7.4 | 7.0 | 5.4 |
| | T | | | | | | | 5.2 | 5.8 | 4.4 | 4.7 | 8.1 | 7.8 | 6.0 |
| 48 | F | 2.9 | 4.5 | 2.0 | 1.3 | 4.4 | 2.9 | 2.2 | 2.4 | 1.5 | 1.9 | 2.8 | 3.5 | 2.7 |
| | T | | | | | | | 2.4 | 2.8 | 1.6 | 2.1 | 3.1 | 3.9 | 2.7 |

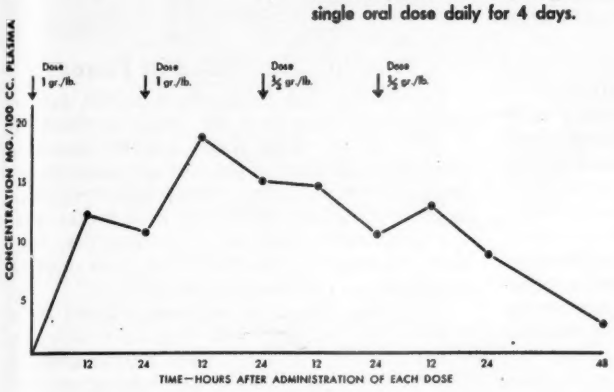
F = Free sulfonamide, mg/100cc plasma T = Total sulfonamide, mg/100cc plasma

only a very small percentage of the absorbed drug is acetylated by cattle.

Experiment III was conducted to determine the rate and degree of absorption when a suspension containing equal parts of sulfamerazine and sulfamethazine in 0.5% tragacanth was given orally as a single dose. Total sulfonamide dosage in this case was one grain per pound (approximately 0.15gm/kilogram) of body weight. Free and total sulfonamide concentrations (expressed as sulfamerazine) were determined on the blood of six animals and it is again shown that only a small amount of the drugs was acetylated.

CHART IV

Average blood plasma concentration of free sulfonamide following a single oral dose daily for 4 days.




The average plasma concentration of free sulfonamide (expressed as sulfamerazine) following a single oral dose of the suspension rose from 3.5mg per 100cc at the end of the first hour to a peak concentration of 14.2mg per 100cc at 12 hours following administration of the dose. Average blood concentrations were 5.4mg per 100cc at 36 hours and 2.7mg per 100cc at 48 hours after a single oral dose.

This indicates that an appreciable blood concentration of free sulfonamide can be obtained and maintained for 48 hours following a single oral dose of the suspension.

These data indicate that a dose of the sulfonamides every 24 or 36 hours is sufficient to obtain and maintain blood levels generally regarded as adequate for therapy.

Experiment IV was conducted to determine the blood plasma concentration of free and total sulfonamide following a single daily dose of compressed tablets, each containing equal parts of sulfamerazine and sulfamethazine. The dose of the total sulfonamide on the first and second day was one grain per pound (approximately 0.15gm/kilogram) of body weight, while on the third and fourth days the dose was one-half of that amount.

TABLE III—BLOOD PLASMA CONCENTRATION IN SIX CALVES (MG/100CC, AS SULFAMERAZINE)

| Animal No. | 1st Day Dose: 1 grain/lb. P.O.* | | 2nd Day Dose: 1 grain/lb. P.O. | | 3rd Day Dose: ½ grain/lb. P.O. | | 4th Day Dose: ½ grain/lb. P.O. | | |
|---|---|---|---|---|---|---|---|---|---|
| | 12 hrs. aft. dose | 24 hrs. aft. dose | 12 hrs. aft. dose | 24 hrs. aft. dose | 12 hrs. aft. dose | 24 hrs. aft. dose | 12 hrs. aft. dose | 24 hrs. aft. dose | 48 hrs. aft. dose |
| 71 | F 11.7 | 9.2 | 17.8 | 13.3 | 13.1 | 9.5 | 11.5 | 8.1 | 2.3 |
| | T 13.1 | 9.2 | 19.0 | 14.8 | 14.2 | 10.2 | 11.6 | 8.5 | 2.6 |
| 72 | F 10.5 | 10.2 | 17.2 | 13.6 | 13.1 | 9.4 | 10.8 | 8.0 | 2.4 |
| | T 11.6 | 10.7 | 18.4 | 14.8 | 14.1 | 10.1 | 11.4 | 8.4 | 3.0 |
| 74 | F 10.9 | 9.9 | 18.4 | 13.7 | 12.9 | 9.4 | 10.7 | 6.7 | 1.6 |
| | T 11.6 | 10.2 | 20.4 | 15.6 | 14.6 | 10.2 | 10.7 | 7.2 | 1.9 |
| 75 | F 12.4 | 8.6 | 16.0 | 11.8 | 11.1 | 7.5 | 9.2 | 5.9 | 1.7 |
| | T 13.4 | 9.3 | 17.9 | 12.9 | 12.0 | 8.0 | 9.5 | 6.3 | 2.1 |
| 76 | F 15.6 | 14.2 | 19.6 | 20.0 | 20.2 | 14.4 | 16.1 | 11.8 | 6.1 |
| | T 16.6 | 14.6 | 21.2 | 21.4 | 22.4 | 15.8 | 18.9 | 12.6 | 7.0 |
| 77 | F 12.2 | 12.6 | 22.6 | 18.0 | 18.0 | 13.0 | 20.0 | 11.1 | 4.8 |
| | T 13.4 | 12.8 | 25.6 | 20.0 | 20.3 | 14.4 | 21.0 | 11.8 | 5.3 |
| AVG. | F 12.2 | 10.7 | 18.6 | 15.1 | 14.7 | 10.5 | 13.0 | 8.6 | 3.1 |
| | T 13.3 | 11.1 | 20.4 | 16.6 | 16.2 | 11.4 | 13.8 | 9.1 | 3.6 |

F = Free sulfonamide, mg/100cc of plasma T = Total sulfonamide, mg/100cc of plasma * = Orally

The average concentration of free sulfonamide (expressed as sulfamerazine) was 12.2mg per 100cc of plasma 12 hours after the first dose and the highest concentration was 18.6mg per 100cc of plasma 12 hours after the second dose. Following the administration of a dosage reduced by 50% there was a gradual decrease in the blood level; however, a measurable concentration was maintained for 36 hours after the last dose was given.

These data indicate that appreciable blood levels can be obtained and maintained in calves following a rather conservative daily dosage schedule with compressed tablets containing equal parts of sulfamerazine and sulfamethazine.

### Conclusion

The intravenous injection of a combination of sulfamerazine and sulfamethazine in aqueous solution, and the oral administration of a suspension or compressed tablets in the dosage used in these experiments produced and maintained appreciable blood concentrations of free sulfonamide (expressed as sulfamerazine). The combination was safe when it was given to young cattle.

## Acknowledgments

The authors wish to express their appreciation to the following associates in the Medical Research Division, Sharp and Dohme: Dr. Karl H. Beyer, Director of Pharmacological Research, for helpful suggestions during these studies; Mr. Paul W. Wilcox, Director of Pharmaceutical Chemistry, and his staff, for preparing the dosage forms of the sulfonamides used in the experiments; and Miss Ethel Williams for carrying out the hematology determinations.

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Raisers of fur animals are in financial doldrums because their product has been "priced out of the market." An investigator for the industry states that mink coats are priced at $1500 to $1700 more than the price of the raw furs they contain and he found a muskrat coat, priced at $1200 that contained only $150.00 worth of pelts.

## Treating Ear Mites in Foxes

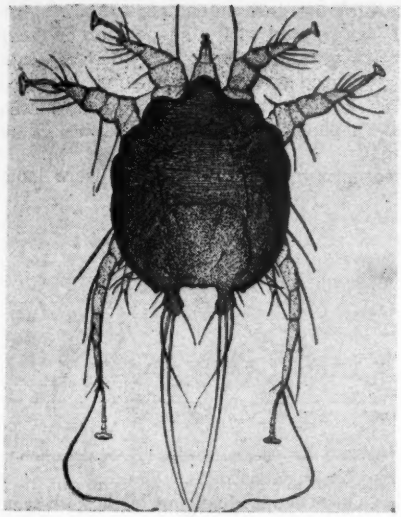
An ordinary oil can to be a useful instrument in treating parasitic otitis in foxes. It is safer to use than glass droppers and is a convenient method of placing the medicament deep in the ear canal. Deep penetration is important, as the mites are first found near the ear drum; later as they multiply, they may be seen as small, white, slow-moving bodies at the entrance of the canal.

The foxes should be routinely treated twice a year. If the treatment can be delayed, it is not advisable to treat them during freezing weather. During routine administration, the oil can may be used to its best advantage, as a large number of foxes can be treated rapidly. If infestation is a new one the parasiticide will probably control the condition. For this routine treatment, we use one part of canex (Merck) to 20 parts of glycerine. Since the two substances do not mix readily, thorough shaking of the container is necessary. If glycerine is not obtainable, mineral oil may be substituted, the canex may be obtained from your local veterinarian.

### More Complete Treatment

If, however, the foxes are showing typical symptoms of ear mites (scratching their ears, shaking their heads and have a foul-smelling discharge in one or both ears), a more complete treatment is needed. In this event, the ear canal and flap must be cleaned of the discharge to allow the drug to have direct action on the mites. To do this have another oil can filled with fresh hydrogen peroxide (3%) and flush the animal's ear as thoroughly as possible. Any remaining scales or crusts can be removed with cotton swabs soaked in hydrogen peroxide. The ear can then be treated with the Canex-glycerine mixture. The treatment should be repeated in about 10 days to kill the mites that escape the first treatment, as well as any that may have subsequently hatched from eggs.

If the fox scratches itself and causes abrasions or wounds on the head, the abrasions should first be cleaned with hydrogen peroxide and then dusted with a good healing powder.—*Am. Nat'l Fur & Market Jnl.* (January) 1949.



***Psoroptes equi* var. *ovis* (male, dorsal view greatly enlarged) the common scabies mite of sheep. The female lays but 15 to 24 eggs in her lifetime.—After Salmon and Styles**

# Benzene Hexachloride Dip to Destroy Scab Mites on Unborn Sheep

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IT IS now well established that benzene hexachloride, referred to in this paper as BHC, is highly effective against several species of pathogenic mites affecting livestock and poultry. Slade[1] referred to its acaricidal properties against the red poultry mite, *Dermanyssus gallinae*, and Taylor[2] employed it very effectively against *Notoedres muris*. Muma[3] reported on the control of hog mange, *Sarcoptes scabiei*, DeGeer, with sprays containing 0.25% gamma isomer of BHC. Cobbett, Peterman, and Beagle[4] eradicated hog mange with sprays containing a minimum of 0.13% gamma isomer of this chemical.

Recently, Kemper[5] showed that a single dipping in a solution containing as little as 0.033% gamma isomer BHC eradicated infestations of the common sheep scab mite, *Psoroptes equi*, var. *ovis*. Kemper's work, however, was performed during the fall, at which time fleeces were short, scab mites relatively inactive, and lesions quiescent. Furthermore, his uniformly successful use of 0.033% gamma isomer BHC for the destruction of sheep scab mites indicated that perhaps even lower concentrations might prove effective. Therefore, it was considered advisable to conduct additional tests, herein described, in an effort to determine whether BHC dips would be effective against psoroptic mites on sheep suffering from clinical mange.

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In addition, the work described in this paper includes tests designed (1) to determine the effectiveness of the gamma isomer alone as compared with technical grade BHC containing all isomers; (2) to ascertain the minimum effective concentration of gamma isomer required to destroy psoroptic mange mites and (3) to determine the time required by various concentrations of gamma isomer to kill scab mites.

## Material and Methods

The tests were carried out in Beauregard, Allen, and Rapides parishes in southwestern Louisiana during April and May 1948. It is the customary practice in that area for sheep raisers to bring their sheep in from the open range during the late spring months, in order to castrate, dock, and ear-mark their lambs. The sheep were almost entirely of mixed breeding, showing a mixture of fine and coarse wool types, with the fine wool predominating. Clinical psoroptic mange was very evident in the sheep at the time the tests were made, many of the animals being in poor physical condition as a result of this parasitism. Numerous active mites were readily demonstrated on each animal selected for the tests. None of the sheep had as yet been shorn, and fleeces were generally from 1¾ to 2½ inches long. Six flock owners, on widely scattered farms, cooperated by providing animals, pens, dipping vats, and small fenced pastures.

In order to determine the general effectiveness of BHC against active, clinical mange, and also to compare the effectiveness of the gamma isomer alone with that of the technical grade of BHC, seven tests (experiment No. 1) were conducted. Five or six heavily-infested ewes or bucks were selected on each of six farms. On one farm, however, the six head were divided into two groups of three each, thus giving a total of seven lots. All test animals were paint-branded. On four of the farms (tests Nos. 1, 2, 3, and 5) the animals were dipped in small, trench-type vats of standard design, equipped with holding facilities and draining pens. On two of the farms (tests Nos. 4, 6, and 7) only 50-gallon steel

drums were available. For small numbers of sheep these served satisfactorily as vat substitutes.

The vats were filled with cool well water, having temperatures of 65° to 75° F. The BHC was sprinkled over the surface of the water and the vat contents thoroughly stirred; the sheep were then dipped in the usual manner. Because wettable BHC had a tendency to settle rather rapidly to the bottom of the vat, it was necessary to stir the dip occasionally, when it was not kept continuously agitated by the swimming movements of the animals passing through the vat. All animals were held in the vats for precisely two minutes, and their heads were submerged briefly at least twice. Thereafter, each lot of sheep was isolated in a small, fenced pasture, and examined for the presence of mites three times in succession at intervals of two weeks. At each examination, the sheep were placed on a table, waist high, and held by an attendant while the skin and fleeces were examined in direct sunlight. The wool over the lesions was parted, and a search for mites was made with the aid of 10X hand lenses. Skin scrapings and wool samples were removed and examined microscopically within a few hours for the presence of mites. None of the sheep were dipped a second time. At the end of the sixth week, the test was terminated.

In experiment No. 1, two types of wettable BHC were employed in charging the vats. The first was a commercial, finely-ground powder, containing 50% of technical grade BHC composed of all isomers, and 50% of inert materials and wetting agents. The gamma isomer content of the product was 6%. Five lots of sheep (tests 1, 3, 4, 6, and 7) were dipped in suspensions containing either 2, 4.15, or 8.33 pounds of this material to each 100 gallons of water. The second product was a finely ground powder composed of 25% of BHC having a 95% gamma isomer content, and 75% of inert materials and wetting agents. This product contained approximately 24% gamma isomer BHC, and this isomer was regarded, from the practical standpoint, as being the sole acaricidal ingredient at the exceedingly dilute concentrations used in tests 2 and 5.

In experiment No. 2, the object was twofold: (1) to determine the minimum effective concentration of BHC required to eradicate psoroptic mite infestations, and (2) to determine the time required by various concentrations of BHC to kill mange mites. Four sheep on two farms were selected because of their extremely heavy mite infestations. The animals were dipped by hand in 55-gallon steel drums, and in all four tests wettable BHC containing 6% gamma isomer was used. Sheep No. 1 was treated with a suspension containing 0.00375% gamma isomer; sheep Nos. 2 and 3 were treated with suspensions containing 0.0075% gamma isomer; sheep No. 4 was dipped in a suspension containing 0.015% gamma isomer.

After dipping, all four sheep were isolated

**After dipping, examinations were made at irregular times up to 44 hours. Each time mites were removed and examined microscopically**

individually in small, shaded pens and were examined at irregular intervals up to 44 hours thereafter. At each examination, mites were removed from the skin and wool, placed on microslides in droplets of lukewarm water, and examined microscopically.

## Experimental Data

*Experiment No. 1.*—Test No. 1: One young ram and four ewes, all showing active lesions of scabies and considerable loss of wool, were used. The dip contained 4.15 pounds of wettable BHC (6% gamma isomer) per 100 gallons of water; the gamma isomer content of the dip was 0.03%. No live mites were found at any time following dipping, but dead mites were recovered from the wool on the 28th day after treatment.

Test No. 2: This lot consisted of seven animals, namely, one young ram, five young or mature ewes, and one lamb. All the animals except the lamb had one or more large scab lesions and great loss of wool. As in the case of the mature animals, however, the lamb was heavily parasitized by mites. The dip was made up by adding one pound of wettable BHC containing 24% gamma isomer to each 100 gallons of water. The gamma isomer content of the dip was 0.03%, the same as in test No. 1. No live mites were found on the sheep at any time after dipping; dead mites were recovered on the 28th and 42nd days.

Test No. 3: Six sheep, consisting of one young ram and five mature ewes, were used. Although the animals all had extremely large, active and chronic lesions and were markedly denuded of wool, they were in fairly good condition. The dip was prepared as in test No. 1 and contained, therefore, 0.03% gamma isomer BHC. No live mites were found at any time after dipping; large numbers of dead mites were recovered from the skin and wool 28 and 42 days following treatment.

Test No. 4: The lot used in this test consisted of six young ewes. Many lesions were small and, except in one case, were of rather recent origin. The

dip contained 8.33 pounds of wettable BHC (6% gamma isomer) per 100 gallons of water; the gamma isomer content of the aqueous suspension was 0.06%. Neither live nor dead mites were found at any time following dipping during a period of 42 days.

Test No. 5: Five old ewes, all showing advanced cases of clinical mange, were selected from a large, badly infested flock. The loss of wool was great, and all five animals were in poor physical condition. The dip was made by adding two pounds of the 24% gamma isomer product to each 100 gallons of water; the gamma isomer content in the vat, as in test No. 4, was 0.06%. No live mites were found at any time during the post-treatment observation period; dead mites were readily recovered from skin débris and wool on the 28th and 42nd days after dipping.

Test No. 6: The three mature ewes selected for this test all showed very extensive, active, and chronic lesions, and were in poor physical condition. The dip was prepared by adding two pounds of wettable BHC (6% gamma isomer) to each 100 gallons of water. The gamma isomer content of the dip, 0.015%, was the lowest used in this series of tests. No live mites were found during the post-treatment observation period; dead mites were recovered from the wool on the 28th day after dipping.

Test No. 7: Three mature ewes were selected for this test; these animals and those used in test No. 6 were taken from the same flock. The lesions were extensive, some being active and others chronic; the fleeces were very ragged, and the animals were in poor condition. The dip was prepared as in test No. 4, the suspension in the vat containing 0.06% gamma isomer. No live mites were found at any time during the post-treatment observation period, but dead mites were recovered from skin debris and wool on the 28th day after dipping.

As far as could be determined, none of the dips used resulted in injury of any kind to the sheep. From the rapidity with which skin lesions healed and new wool appeared on former denuded areas, all the dips were of equal effectiveness. On the 14th day after treatment, all the former lesions showed marked improvement. Pruritus had ceased, and the sheep were grazing normally. Erythema was no longer visible, nor was there evidence of acute irritation. There were still, however, many incrustations. Where advanced active lesions had existed prior to treatment, heavy crusts were beginning to separate from the skin. The skin at the site of former chronic lesions was still thickened but felt more pliable and no longer cracked or bled when compressed between the fingers. On the 28th day after treatment, the incipient lesions had healed so completely that their former sites were difficult to locate. The epidermis over these areas was now a normal pink color, with a pliable texture and oily appearance. The characteristic heavy crusts over the more extensive active lesions were now well raised above the skin, with a substantial growth of wool. In many places, pink, oily skin surfaces were visible despite adjacent areas on which chronic irritation was evident in the form of a marked keratosis.

On the 42nd day after treatment, only a few limited areas of slightly thickened skin were detectable at the sites of former chronic lesions. In general, the skin almost everywhere was pink, oily, and pliable. Incrustations had been pushed up into the wool by virtue of new wool growth for a distance of approximately ¼ inch or more. In several instances, however, particularly in sheep involved in test No. 5, healing was slow, and thickened skin denuded of wool was evident. On these five animals, the skin was noticeably devoid of oil, and the sheep were in poor physical condition.

The healing process and the rate of new wool growth appeared unaffected in any way by the variation in concentration of technical grade BHC in the dipping vat. In the same manner, the use of nearly pure gamma isomer in the dipping vat resulted in rapid death of the mites and in normal resolution of wounds. Neither technical grade BHC nor the nearly pure gamma isomer in the concentrations used appeared to possess healing properties, but both proved to be equally effective acaricides. The high gamma isomer preparation, however, seemed to have the distinct advantage over technical grade BHC in that it showed a tendency to lose its characteristic musty odor much more quickly than did the latter. The objectionable odor in the fleeces of sheep dipped in a 0.06% gamma isomer suspension prepared with nearly pure gamma isomer (test No. 5, experiment No. 1) was scarcely detectable 14 days after treatment. By contrast, sheep dipped in a suspension containing the same gamma isomer concentration supplied by technical grade BHC were readily identified by the odor in their fleeces six weeks after treatment. As a matter of fact, the odor of technical grade BHC is so lasting that it has been detected by us in the fleeces of unshorn sheep as long as six months after dipping. The relative absence of odor following the use of the nearly pure gamma isomer dip is a matter deserving of comment. There has been some objection to the possible transfer of the BHC odor from the fleeces to the carcass during the butchering process. Growers and feeders alike who have hesitated to dip sheep in BHC prior to delivery to packing houses will find the high gamma powder far less objectionable.

## Experiment No. 2

*Experiment No. 2.*—Test No. 1: At the end of two hours, none of the mites on a ewe dipped in an aqueous suspension of 0.00375% gamma isomer BHC were able to crawl, but practically all of them exhibited some leg movement. The leg movement

was observed in mites removed from the skin and fleece at irregular intervals up to 30 hours. At the 30th hour, vigorous, newly emerged larval mites were found in the skin scrapings; the larvae moved about freely in a droplet of water on the microslide when transferred from the skin.

Test No. 2: Adult mites on a wether dipped in a suspension containing 0.0075% gamma isomer BHC showed some feeble leg movement for 30 hours after treatment, but no live larvae were seen at any time during this period.

Test No. 3: Mites on a heavily infested young ram dipped in a suspension containing 0.0075% gamma isomer BHC showed some feeble leg movement for 30 hours, but none whatever on the 44th hour after dipping, nor at any time thereafter. Dead adult mites, but no live larval or adult mites, were found on this sheep during a 12-day period following treatment.

Test No. 4: Mites on a young ram dipped in a suspension containing 0.015% gamma isomer BHC showed no leg movement whatever two hours and 45 minutes after dipping. At no time during a 12-day period thereafter were live larval or adult mites seen on the animal, although microscopic examination of wool and skin scrapings repeatedly showed many dead mites.

**Following dipping the dried serum crusts were raised by the new growth of wool. A marked improvement in the color and pliability of the skin was noticeable at examination on the 10th, 29th, and 42nd day after dipping**

### Comment on the Experiments

All the animals involved in the tests described herein were exceptionally heavily infested with mites. In many instances, it was necessary only to part the wool at the periphery of acute lesions to see with the naked eye live mites crawling about in large numbers on the exposed skin surfaces. In association with chronic lesions, however, the 10X hand lenses revealed relatively few mites. In these cases, the mites were not found in the center of chronic lesions, which were generally denuded of wool, but rather at the periphery where the skin showed evidence of acute inflammation.

As a result of heavy mite infestation, all the test animals, without exception, presented a startling picture of clinical mange. Every variation of the disease was present in one or another of the animals, from minute, incipient, active lesions to chronic incrustations which involved fully a third of the body surface of the animal. In most instances, all stages of development of lesions could be demonstrated on a single animal.

The first symptoms of scabies were indicated by tagging of the wool. This disturbance of the fleece was caused by biting and scratching as a result of severe itching. At such points, a few mites could be seen clustered on a minute area of the skin showing erythema and slight swelling. These reddened areas, originally perhaps only ¼ inch in diameter, resulted from minute skin punctures. They were characterized by a serum exudation which coagulated and dried to form crusts or scabs. The yellowish papules described by Herms[6] and others were not seen at this stage. As the mites expanded their activity, the crusts became larger and thicker. In 10 days, the lesions increased in size to over one-half inch in diameter and the reddened centers later developed a bluish appearance as a result of intense congestion.

At approximately 30 days, the areas were usually an inch or more in diameter, and the crusts of dried serum had enveloped the base of the wool fibers. There were indications that the first manifestation of noticeable hyperkeratosis occurred in about 60 to 90 days from the start of the infestation, at the center of a lesion roughly from three to six inches in diameter. At this time, the accumulation of dried serum or "scab" was sufficient to force the wool fibers out of their follicles with the subsequent appearance of small bare patches in the center of the lesions.

On the animals involved in these experiments, chronic lesions varied in size from that of the palm of a man's hand to areas extending, as previously stated, over a third of the skin surface on some of the sheep. Practically all the chronic lesions were bare of wool, and in nearly all cases the skin was indurated, thrown into folds or wrinkles, cracked in places, and two to three times the normal thickness. Most of these areas were totally or in part covered by crusts; some were dry and smooth, and others were covered with loose, flaky, bran-like scales resulting from epithelial exfoliation.

Following treatment with BHC dips, the healing of incipient and chronic lesions progressed rapidly. As early as the 4th day, serum exudation had ceased, and shortly thereafter, erythema was reduced. As early as the 9th day, partial resolution of acute lesions was detectable, and in the case of chronic lesions, scurf and crusts were beginning to separate from the skin. By the 14th day, cracks in the skin, some of which had been exuding blood, were healed, and the pinching of chronically thickened areas between the thumb and forefinger no longer resulted in the breaking of the skin surface. Four weeks after treatment many of the smaller, acute lesions were no longer visible. The massive crusts over the older lesions were entirely separated from the skin, and new wool growth was apparent. Skin color was generally healthy, and some secretion of oil under flakes of exfoliated epithelium was detectable. At the end of six weeks the skin everywhere, except in isolated instances, had softened completely, was free of incrustation and oily in appearance, pink in color, and covered with from 1/16 to ¼ inch of new wool growth.

The resolution of chronic lesions did not progress uniformly on all the sheep, nor was the rate of wool growth over the site of former lesions at all uniform. In test No. 4 of experiment No. 1, and to a somewhat lesser extent in tests Nos. 6 and 7, the rate of healing and wool growth on many of the animals was subnormal. In general, the physical condition of these sheep was poorer at the end of six weeks following dipping than two weeks previously. Inquiry into causative factors revealed that all these animals subsisted on limited pastures with inadequate grass coverage. Several of the poorest sheep were very old and toothless and, without exception, the animals supported extremely heavy gastrointestinal nematode populations. Differential egg counts made late in May 1948 of some of the more highly parasitized of these sheep revealed approximately 3500 eggs per gram of feces, chiefly those of *Haemonchus contortus* and Trichostrongylus spp. Apparently the general physical condition of the sheep played an important role in the rapidity of resolution of mange lesions.

BHC has the distinct advantage of destroying not only all mange mites, but also certain species of lice and true ticks. On most of the mite-infested sheep selected for test purposes, moderate to heavy infestations of the common red biting louse, *Bovicola ovis*, were found. In addition, the three sheep on one of the farms (experiment No. 1, test No. 7) were rather heavily infested with the lone star tick, *Amblyomma americanum*, and moderately infested with the Gulf Coast tick, *A. maculatum*. These sheep were dipped in a suspension containing 0.06% gamma isomer. At two and four hours after treatment, a small percentage of the lice and both species of ticks continued to show feeble leg movement; large numbers of the lice and some few lone star ticks, however, appeared to have been destroyed within the second hour. Six hours after dipping, no indication of life was detected in any of the lice or ticks, a large number of which were removed from the sheep for close examination. Two weeks later, an occasional dried, shriveled lone star tick still remained attached to the skin; however, nearly all the ticks had been dislodged from the sparsely-wooled areas of the body where they had been previously attached. The three animals were isolated after treatment in a small, dense, brush-covered pasture which had earlier been occupied by tick-infested sheep. The tick population in this pasture was undetermined, but there was reason to believe that both species of ticks existed there. In any event, repeated examinations of the dipped sheep revealed no reinfestations with lone star ticks at any time during a 42-day period, and only one live Gulf Coast tick was found in the ear of one animal on the 42nd day after treatment.

### Effect of BHC Dipping on the Flesh

The question of the possible detection of the odor and taste of BHC in the flesh of recently dipped sheep has been a disturbing one. In an effort to throw some light on this matter, an odor and taste test was conducted at Albuquerque, during the early fall of 1948. Three young ewe lambs, weighing an average of 55 pounds, were dipped in a suspension of 8.33 pounds of wettable 50% benzene hexachloride per 100 gallons of water; the benzene hexachloride powder contained 6% of gamma isomer, whereas the gamma isomer content in the suspension was 0.06%. The ewe lambs, with fleece one inch in length, were held in the dip for two minutes and were then

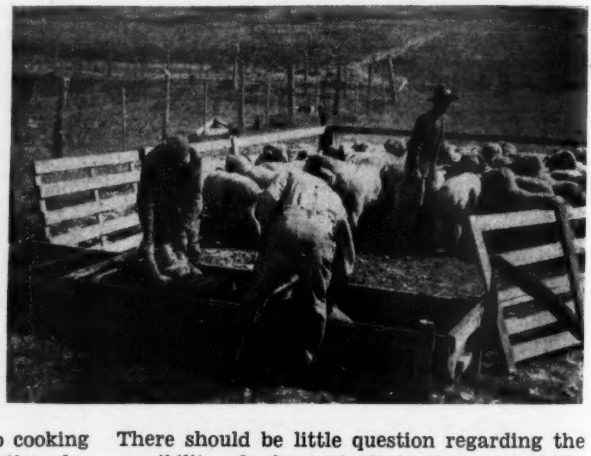
turned out on mixed green grass pasture. In addition to pasture, the lambs were given all the alfalfa hay they could eat.

Seven days following dipping, lamb No. 1 was slaughtered. The fleece, which still carried a strong odor of BHC, was removed in the usual way. The carcass was eviscerated and dressed, and cuts prepared by a competent butcher. The various cuts of meat were distributed among eight households, and eight cooks either roasted, broiled, stewed, or fried the meat. None of the cooks detected an odor of BHC in their refrigerators prior to cooking and only three of eight were aware of the odor during the first few minutes of cooking. A total of 22 persons ate the meat; four persons in two homes disliked meat, and reported a somewhat metallic taste. The remaining 18 at six dinner tables found no fault with the lamb whatever.

Lamb No. 2 was slaughtered 14 days after dipping, and six of the seven cuts were distributed among six cooks. The 7th cut was used for laboratory determination of odor and taste. The various cuts were refrigerated for periods of from two days to 11 days, during which time no odor of BHC was detected in seven refrigerators. The meat was either roasted, fried, or stewed in six households, and in the laboratory was boiled. None of the cooks detected the odor of BHC during cooking, but six persons thought they detected either a metallic or chemical taste. Sixteen diners reported complete satisfaction with the meat. Laboratory tests with the meat were negative for odor and taste suggestive of contamination with BHC.

Lamb No. 3 was slaughtered 21 days after dipping. Eight cuts were distributed among eight cooks. None of the cooks detected undesirable odors either in their refrigerators or during the cooking process. Twenty diners ate the meat, which had been either roasted, broiled, fried, or stewed. No one detected the taste of BHC.

These observations indicate that the odor and taste of BHC in the meat of lambs dipped in therapeutic quantities of BHC are at no time offensive and are, in fact, barely detectable. Approximately 21 days following dipping, neither the odor nor taste of BHC was at all distinguishable. From this standpoint, therefore, it appears safe to recommend the use of BHC dips for the control of mange on sheep. There should be little question regarding the possibility of odor or taste in the meat if the dipped sheep are held for about three to four weeks before being slaughtered.



**In these experiments dipping vats were not always available and facilities had to be improvised. Lambs were dipped successfully in 55-gallon steel drums but the method is a slow one. In the illustration a watering trough is being used to dip a ram. However, with no draining pen, these make-shift facilities are uneconomical because of waste of dip**

### Residual BHC Effect

In connection with the search for the possible existence of live mites on the skin and in the fleeces of dipped sheep involved in experiment No. 1, a great many skin scrapings and wool samples were examined during the 42-day period after dipping. Superficial scrapings were made with a dull-edged scalpel over the site of former lesions; fragments of scurf and incrustations were included. Wool samples were cut off close to the skin and were placed in wide-mouthed jars to avoid agitation and the consequent loss of mites. These samples were all examined one to four hours after collection. They were placed between two microslides bound with rubber bands and examined either wet or dry, under low-power magnification of a microscope. As stated earlier in this paper, no live mites were found in this manner at any time on the 14th, 28th and 42nd days after dipping. But curiously enough, dead mites, either in their entirety or fragmented, were readily found as late as the 42nd day after treatment. Some of the mites were particularly well-preserved, evidently having

been entrapped within the masses of greasy incrustations and exuviae. This observation is regarded as of some importance, for if the scrapings had been digested in the potassium hydroxide solutions before careful examination in their natural state, the intact mites could easily have been mistaken for specimens recently destroyed.

### Recommended Concentration of BHC in Dips

Despite the fact that gamma isomer concentrations as low as 0.015% were found to be effective in eradicating infestations of psoroptic mites from several groups of penned sheep, the authors suggest that no less than 0.06% gamma isomer BHC be used in general mange control operations on farms and ranches. Under the ideal conditions of a controlled experiment, naturally, the minimum lethal quantity of an acaricide or insecticide may prove effective repeatedly. On the farm, however, under ordinary working conditions, the reverse is frequently the case. The contents of large vats are often underestimated. The fleeces of sheep, like the hair of cattle, have a tendency to filter solid matter from suspensions, resulting in dips of progressively lower concentrations as increasing numbers of animals pass through the vats. Heavy rains may dilute acaricidal materials in the fleeces of recently dipped animals to a point below that of complete effectiveness. Dirt and extraneous materials carried into the vat by hundreds of animals often render minimum concentrations ineffective. The list of contributions to the possible failure of minimum lethal quantities of an acaricide is a long one. A concentration of 0.06% gamma isomer BHC is recommended as being considerably higher than that required under ideal circumstances, and should be ample for whatever allowances must be made on the farm.

### Summary and Conclusions

1. Heavy infestations of the common sheep scab mite, *Psoroptes equi*, var. *ovis*, were eradicated from five isolated groups of unshorn sheep totalling 23 animals The animals were dipped only once in aqueous suspensions of commercial wettable BHC. The product used had a gamma isomer content of 6%; the gamma isomer content of one dip was 0.015%, of two dips, 0.03%, and of the two remaining dips, 0.06%.

2. Heavy infestations of the common scab mite on two groups of unshorn sheep, totalling 12 animals, were eradicated by a single dipping in aqueous suspensions of wettable BHC having a nearly pure gamma isomer content. The product used contained 24% of BHC of 95% gamma isomer content; the gamma isomer content of one dip was 0.03%, and the other 0.06%. The residual, characteristic odor of the high-gamma BHC dip was only faintly detectable in the fleeces of sheep two weeks after dipping, and was entirely dissipated at four weeks.

3. A dip containing 0.00375% of gamma isomer failed to eradicate an infestation of scab mites from one ewe; a dip containing 0.0075% of gamma isomer destroyed all mites on one ram in less than 44 hours; a dip containing 0.015% of gamma isomer destroyed all mites on one ram within two hours and 45 minutes.

4. Wettable BHC dips used in the eradication of scab mite infestations also destroyed all red biting lice, lone star ticks, and Gulf Coast ticks, large numbers of which were found on three sheep at the time of dipping.

5. To avoid possible failure in psoroptic mange eradication programs on farms and ranches, under conditions which are unpredictable and often uncontrollable, the use of not less than 0.06% of gamma isomer in the dipping vat is recommended.

6. Taste tests indicate that a very faint, unpleasant odor and taste may be imparted to the meat of lambs dipped in a suspension containing 0.06% gamma isomer derived from a commercial product composed of 6% gamma isomer, 44% of all other isomers of BHC, and 50% of wetting agents and diluents. This odor and taste were recognized by approximately 25% of the eight cooks and 22 tasters in meat from lambs slaughtered one and two weeks after dipping; no undesirable taste or odor was detected in a lamb slaughtered three weeks after dipping. From the evidence presented in this paper, it appears that lambs may be slaughtered for food purposes at any time after three weeks following dipping in BHC suspension.

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# Spontaneous Tumors in Dogs

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IN A PAPER in *Veterinary Medicine*, one of us (L.F.W.) listed the numbers of various types of malignant and benign neoplasms found in dogs in the Whitney Veterinary Clinic and diagnosed by two pathologists at the Yale Medical School* and one at Jackson Memorial Laboratory**. The total number reported was 158 and they were divided as follows:

| *Sarcomas* | *Carcinomas* |
|---|---|
| Benign | Benign |
| Malignant | Malignant |

Since then a large additional number of neoplasms have been removed from dogs, fixed in 10% formalin, sectioned and studied. It was found that there was some slight disagreement among pathologists as to the interpretation of some of the slides and there are admittedly schools among pathologists who, from training and research, differ in their interpretation of the histological appearance of sections, although these differences are becoming minimized with fuller exchange of material and with increasing opportunities of observing outcome or development. Also it has been learned that in some manner students of human pathology may not have observed in the human species, growths which are fairly common in dogs.

*Dr. Harry Zimmerman and Dr. Harry S. N. Greene.
**Dr. Clondman.

By concentrating the attention of a single pathologist on a group of neoplasms, a uniformity of diagnosis is accomplished, and by following subsequent development and the lives of animals operated upon, considerable information can be assembled which would be of value to veterinarians and students of cancer in general.

Results of this present study are being published simultaneously in *Veterinary Medicine* and *Cancer* so that the material will thus become available to the largest number of interested persons.

A bibliography in the cancer journal attempts to bring together the studies in dog neoplasms. Many reports in various journals have been omitted because they often appear too inaccurate in their diagnoses of individual tumors described and their descriptions negate the likely form of neoplasm. Some were studied by specialists and furnish valuable contributions.

One of the observations of special interest to veterinarians and pathologists alike is that dog owners are so often inveterate procrastinators. How many of them could have allowed tumors to have grown to such sizes without consulting a veterinarian is more than amazing. One Boston Terrier had a tumor in the abdomen which weighed nine pounds while the dog, after the tumor was removed, weighed only 15. Another, a German Shepherd, developed a tumor of the udder which was eight inches long, shaped like a football, and dragged the ground, wearing itself away and emitting such an odor that the dog was kept in the garage. Another dog weighed 36 pounds and had developed a tumor in the lungs weighing 11 pounds. A French Poodle weighing 13 pounds had grown a tumor on the side of the face which was larger than the head and another of the same breed grew one on the side of the neck as large as a medium sized grapefruit. Its weight pulled the dog's head around almost 90 degrees. A 60 pound hound developed a mammary tumor weighing 11 pounds.

Some interesting coincidences (?) appeared. A Bloodhound developed a fast-growing malignant cancer just over the last ribs and in the middle of one side. Her son developed a growth when he was six years of age in the same location. It grew very rapidly—but this was a lipoma. Two Cocker Spaniels developed the same type of cancer—a rare lethal one, and later, it was learned that they were cousins.

Another matter of interest was the percentage of dog owners unwilling to permit post-mortem examinations of their animals. Curiously enough, this percentage was just what it was in a large hospital for humans, where such a record was kept—25%.

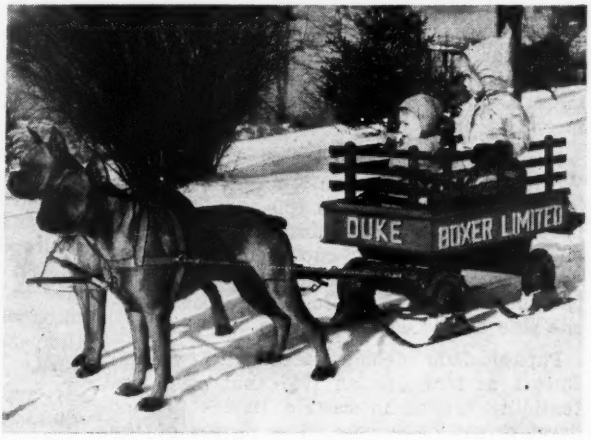
An attempt was made to determine breed susceptibility but the numbers were not significant in many cases. The quota fulfillment was derived by taking the first 2000 cards in the Clinic files and determining such facts as the number of males and females, and the number of each breed. Then the last 2000 cards were similarly studied and finally every fourth card through the active list was tabulated. The numbers corresponded closely and furnish a reliable cross-section of dogs by sex and breed.

From a comparison of our tumor cases by breed with the breed population, we conclude that Collies, Beagles, Smooth Coated Fox Terriers and Spitz appear to have a lower incidence than others — Boston Terriers, Wire Haired Fox Terriers, Irish Setters, Scottish Terriers and mongrels are at the other extreme. We conclude, too, that some breeds are more likely to develop certain kinds of tumors: Scottish Terriers frequently have melanomas; Cocker Spaniels are relatively free of them. Airedales, Scottish Terriers and mongrels show the greatest tendency to malignant growths.

Of the 414 dogs with benign or malignant neoplasms, 188 are males and 126 are bitches, showing a greater tendency for male dogs to develop neoplasms than for females to develop them. However, there were many more spayed females than castrated males.

The greatest incidence of tumors is in the six to 10-year group. Only the Boxer breed is an exception. Thirteen of 19 Boxers with growths were less than six years of age.

The authors find it necessary to take exception to some conceptions of malignancy. Gross appearance is certainly no guide to the life history of a tumor. It gives no indication of the dynamics and time relationships involved in the process of the tumors becoming autonomous. Autonomous tumors are malignant tumors according to general agreement but this state is not at once achieved. It requires a phase of growth involving limited differentiation before the autonomous state begins. If a growth can be transplanted to the eye of an alien host — a rabbit or guinea pig — and survive, it is then malignant according to Greene, and in that we concur. Morphological appearances in a tumor do not always remain static but tend to change as the growth alters in its biological behavior.




**The greatest incidence of tumors occurs between 6 and 10 years except in the Boxer—13 of 19 Boxers with growths were less than six years of age**

A dog's life is long enough to make some studies as to these changes. We found certain types of tumors which showed none of the histological criteria necessary for a diagnosis of carcinoma or sarcoma, which later altered their histology, recurred and even metastasized.

Most of our specimens appeared like human material and the same corresponding types. There were exceptions: coal black pigmented melanotic neoplasms with sarcomatous histological appearance; breast lesions containing bone and cartilage; testicular differences; well encapsulated circumanal tumors, with ulcer formation and local extension outside the capsule occurring often; primary splenic sarcoma occurring more often than in man.

The commonest types of canine tumors are

lipomas, melanomas, tumors of breasts and testicles and circumanal tumors.

There are about an equal number of benign and malignant tumors in dogs, if we assess them on the basis of histological grounds.

Other students have reported melanomas rare in the dog, but we find them among the most frequently occurring forms. We had difficulty at times in separating them from nevi and from what we have called "cellular sarcoma." It was interesting to note how often the extremities of dogs were involved with melanomas. In man, pigmented tumors occur, particularly on the soles of the feet, and we found melanomas on the trunk of dogs in few instances. Melanomas were seen as melanosarcomas and melanocarcinomas. A melanotic lesion may present pigmented metastases and vice versa as in the case of man.

Breast tumors are not confined to females. We found three males in a total of 41 cases of mammary tumors, and this type of tumor is frequently mixed; fibroadenoma, fibrochondroma, fibro-osteo-chondroma; chondro-osteo-sarcoma; osteosarcoma and others. One case metastasized to a foreleg on the opposite side of the body.

Papanicalaou demonstrated with vaginal smears as long ago as 1927 that some potentiality existed in certain tissues for the development of tumors. The results of the use of heptaldehyde in cases of mammary tumors in dogs treated with that drug, in a way verifies his premise. In no case where the drug caused regression of the tumor was a cure effected. All of the bitches had recurrences. And, incidentally, the case of a hound bitch is interesting. She developed two lumps in the udder as large as walnuts, one as large as a hen's egg, and several smaller nodules, all of which disappeared spontaneously after the next mating cycle following which she developed the udder enlargement expected in a bitch which ovulates. Spaying may have a similar effect. In most cases, bitches which were spayed and whose mammary tumors were simultaneously removed, failed to develop new tumors. Breast tumors were found in spayed bitches but not necessarily of the same type as those which developed when the bitch was still in possession of her ovaries. Since the uterus also is removed in the oophorohysterectomy, it has been by no means demonstrated, that the removal of the ovaries is the cause of the usual failure of mammary tumors to develop again. We do not know that the uterus may not be involved. Removal of breast tumors without spaying apparently is followed by a high percentage of recurrences.

Among the tumors removed, five proved to be teratomas. All had hair in them; three had teeth.

Testicular tumors developed in the older dogs. This is in keeping with Innes' findings and may further substantiate his ideas that the biological history of testicular tumors is long. Some were interesting and of value to veterinarians. A case of a Bloodhound is interesting. Over a period of five years he became sterile whereas he had previously sired many litters. His mammary glands, particularly the teats, grew enormously. The teats hung four or five inches below the abdomen although the breasts showed little development. One testicle was found only partly descended and greatly enlarged; the other had atrophied. The enlarged testicle was removed and soon the dog began to lose his feminine characteristics; the teats shrank and the atrophied testicle rapidly grew to larger than normal. His power of spermatogenesis returned and he was fertile as was demonstrated by the siring of a litter of puppies, and by the large swarm of active spermatozoa which curiously enough were 50% larger than sperm of related Bloodhounds.

The circumanal tumors, probably more or less specific in the canine species, are sweat gland carcinomas. In sections from other parts of the body we have also found sweat glands and we agree with Ruddick and Willis that "dogs can and do sweat" despite the usually held opinion to the contrary. These tumors can be differentiated into adenomatous and carcinomatous forms showing the change in biological characteristics. Three of the cases were syringomas and one was a hydradenoma.

Twenty nine young dogs, all under five years of age, presented tumors which we designate as "cellular sarcomas." They appear identical to previously described transplantable or infectious sarcomas. Boxers were prone to develop them. They are transplantable, anaplasmic tumors acknowledged to be a disease and yet in the majority of cases, they are benign tumors. Histologically, the biological appearances are strikingly similar to those of normal mouse placenta.

Because they show such similar morphological appearances, we are designating fibroadenomas, basal cell sarcomas, and hair sheath tumors as "cylindromas." They are benign tumors and probably abortive hair follicle structures.

Lipomas have an interesting characteristic. Since they have been removed in many in-

stances and in 43 cases were verified by biopsy, not one ever recurred at the same site even though it was sometimes impossible to remove every trace. It would seem, therefore, that they are not only the commonest type but the type most successfully removed. In some dogs they have a tendency to develop anywhere on the body and legs. In other dogs, they may be confined to the chest and belly. In several cases, lipomas were found on dogs in which other neoplasms were also growing.

Previous reports have indicated the rarity of hemangiomas in dogs. In our series were 27 occurrences.

Although owners were always advised that papillomas were the manifestations of a disease which is self-limiting, and they would fall off in time, many could not stand the odor which developed by the bacterial decay among them and insisted upon their removal. The mouth seldom fills with them again. These flower-like tumors were sometimes found outside of the mouth, but usually not beyond the smooth surface of the lips. While more often constituting a disease of young dogs, they have been found in dogs up to six years of age. One six-year-old dog had five papillomas growing out of a spot where the hair was white on the tip of the chin. Two of the tumors were white and three black. They gave the appearance of a bunch of tiny strawflowers.

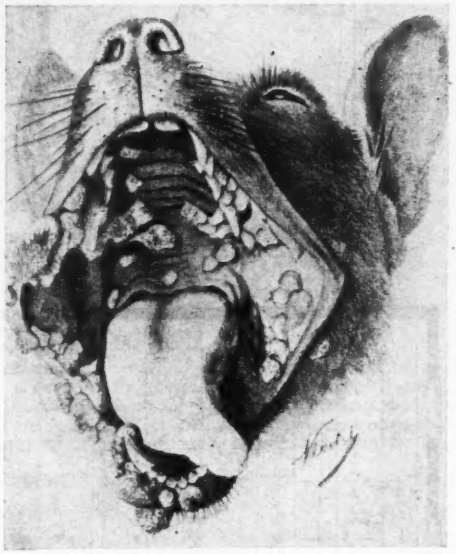
Nerve tumors occurred in 15 dogs in our series. "Encapsulated neurofibromas" was our finding but despite this diagnosis, three recurred and one dog died with gross tumor extension.

Fibrosarcomas tended to metastasize—six of 14—to the viscera.

No attempt was made to study bone cancers although a number were observed and diagnosed by x-ray. Both osteosarcomas and periosteal forms were found. The x-ray may be useful at times in diagnosing or verifying diagnoses of skeletal abnormalties which result from lung cancer. The bronchogenic type of adenocarcinoma may cause tremendous thickening of the legs along with what appear to be bone protuberances on skull, scapulae, and other bones. One such case showed great lung enlargement with general body emaciation.

Nine cases of lymphomas were found with lymph node enlargement. Some features suggested Hodgkin's disease but in no case did we feel such a diagnosis was justified. Two of these cases, where the diagnosis was lymphoblastic lymphoma, are today well following surgery. The other seven cases lived from three to 50 months after their operations. There were many cases not studied histologically where generalized lymph node and splenic enlargement was well advanced. Blood and gland studies showed that none of these was characteristic of Hodgkin's disease.

Many dogs bearing more than one type of tumor were found. Ten cases had two or three kinds of benign tumors while 15 harbored one malignant and one benign; four presented two malignant tumors each.



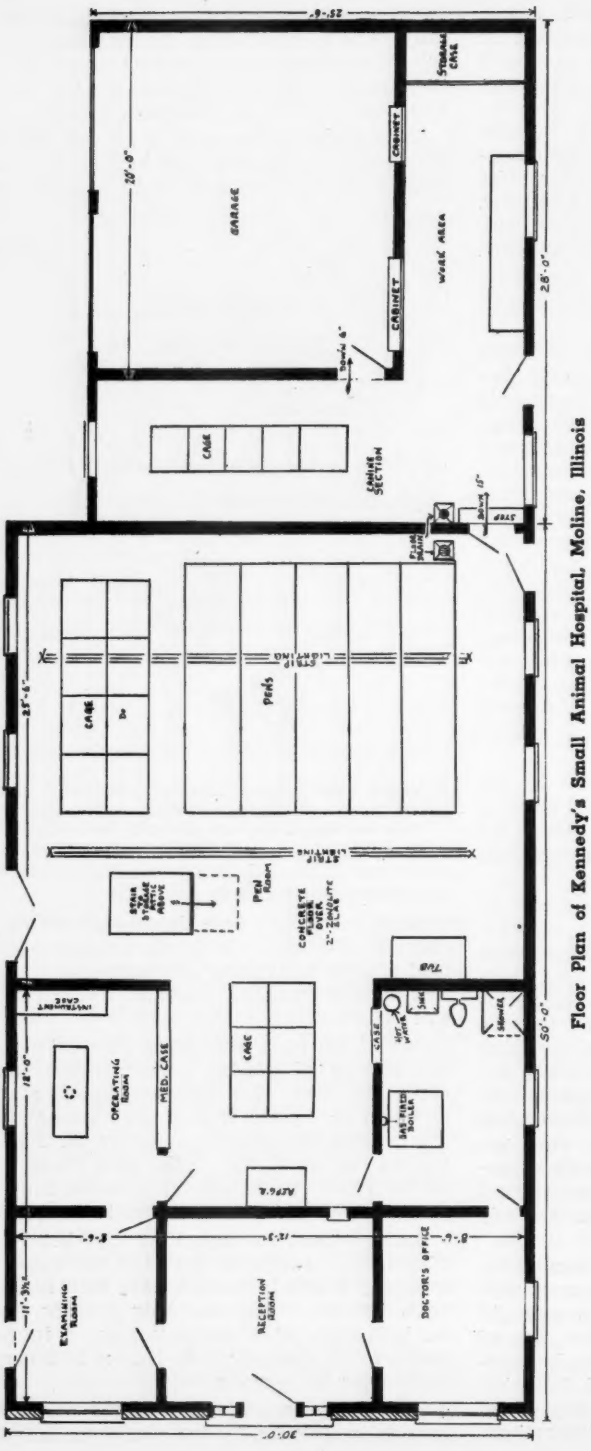
**Although self limiting owners often have papillomas removed because of odor from bacterial decay, the mouth seldom fills with them again**

Some very young dogs developed malignant cancers. A French Poodle six months of age died of liver and spleen growths; having been sick for three months. The oldest dog studied was almost 20.

One of the most interesting observations is the paucity of ovarian tumors, other than cysts. In over 8000 oophorectomies, many of which were performed on older bitches, not one ovarian neoplasm was discovered. Fibromatous tumors of the vagina were found but on the whole the female reproductive tract is reasonably free from new growths.

Brain tumors in dogs have not been reported. It is suggested that any dog showing spasticity might be anesthetized with sodium pentobarbital. If the spasticity remains, it is an indication of a brain tumor; if it disappears, the spasticity may be due to inflammation, as in encephalitis.

Our study emphasized the excellence of dog neoplastic material for investigation.




Floor Plan of Kennedy's Small Animal Hospital, Moline, Illinois

## Another New Animal Hospital

Doctor Earl R. Kennedy's new animal hospital at 3721—5th Avenue, Moline, Illinois, was the subject of an article by feature editor Klaun in the *Moline Daily Dispatch*.

The hospital was planned by Doctor Kennedy, who has practiced in Moline since his graduation from the Terre Haute Veterinary College in 1915.

The sketch at the left shows the floor plan of "Kennedy's Small Animal Hospital," as it is known. With the equipment it cost approximately $35,000; the halftones at the right show an exterior view and Doctor Kennedy at work amid the facilities with which the hospital is equipped throughout. The floors are built of 12 inches of sand and gravel, eight inches of moisture proof solite, and six inches of concrete with metallic hardening finish. The waiting room, examination room, operating room and private office have marflex floors.

The walls are transite material, except in the waiting room, examination room and private office where they are corrugated knotty pine. The baseboards are concrete except in these three rooms. All inside walls are six inches thick and the doors are slab doors. The draperies are of unbleached sheeting for easy and frequent laundering.

Instant fluorescent lighting is used throughout the building. There are germicidal lights in the examination room and in the contagious ward. The heating plant is gas-hot water.

Outside runways covered with canvas are provided on the east side of the building which faces south. The floors of the runs are of concrete and there is a drain for each. Hose attachments provide hot and cold water for washing.

KENNEDY'S SMALL ANIMAL HOSPITAL

This illustration shows the south (front) and west exposure of the building of which the floor plan (except for the concrete ramp and porch) is given on the preceding page, and the garage which serves both for the hospital and Doctor Kennedy's residence which is adjacent. The concrete ramp and the porch at the front are not shown in the floor plan. Lantern type light at all four corners and above the doors amply light the exterior. The capacity of the hospital is 85 animals

Doctor Kennedy and assistant in the examination room. This room contains a washbowl, hot and cold water, a germicidal light, extra black curtains for the doors and windows when the fluoroscope is being operated

## The Bite of the Shrew

The article appearing in the December (1948) issue of Veterinary Medicine under the caption, "The Shrew Once a Villain; Now a Benefactor," gave a very interesting description of shrews in general but omitted to mention that one species—namely, the short tailed shrew, *Blarina brevicauda* does actually possess a poisonous bite, in spite of the fact that the article in question casts rather disparaging remarks about the "alleged" superstitious beliefs of early European writers. To avoid possible confusion, it might be advisable to specifically identify "the shrew that is *again* a villain."

Shrews have a cosmopolitan distribution and are found all over the world with the exception of South America and the Australian region. In the United States there are, according to H. E. Anthony[1], five groups or genera inhabiting the North American continent—namely, common and long-tailed shrews (Sorex), pigmy shrews (Microsorex), little shrews (Cryptotis), a very rare species—the Crawford or gray shrew (Notiosorex) and the short-tailed shrew (Blarina). Two of these are known to have a poisonous bite although the saliva of the long-tailed species seems to have only a slight crippling effect on its victims. The real culprit, as previously stated, is the short-tailed shrew, *B. brevicauda*. It is represented in the Eastern portion of the United States by seven geographical races or subspecies. The typical habitat of these is dark, damp localities. It is possible or even probable that other species of shrews may possess a poisonous bite, because European writers even "way back" in ancient times believed that shrews (or shrew mice as they called them) were able to cause sickness and death by their bite. This knowledge (which may have been somewhat exaggerated) seems to have been forgotten and modern writers up to quite recently regarded such beliefs as merely superstitious folk lore.

As the late Alfred E. Smith was wont to say, "Let's examine the record"; or in this case, let us present the scientific evidence.

Dr. Oliver P. Pearson[2] and later Miss Barbara Lawrence[3] published definite evidence that the bite of the short-tailed shrew is poisonous. The poison which appears to be similar in action to the venom of the cobra is secreted by the salivary glands and enters the wound *via* the groove between the long incisor teeth. Mice into which the poison has been injected (or after being bitten) by a short-tailed shrew, quickly become sluggish and breathe heavily. The hind legs next become paralyzed and the rodents move with considerable difficulty. Large doses of the poison produce convulsions and death from respiratory failure. The lethal dose appears to be in the neighborhood of 300mg per kilogram. A dose of 6mg of ground up salivary glands proved sufficient to kill a mouse of 20 grams. The entire salivary glands when ground up and injected into mice contain enough poison to kill 200 of them. It may therefore be readily understood that a full grown, short-tailed shrew has little difficulty in incapacitating and devouring a mouse twice as large as itself.

In man, the effects of the poison, while not lethal are nevertheless unpleasant. For instance, a naturalist bitten by a shrew reported a sensation of burning at the site of injury. This was followed shortly by shooting pains in his arm and he suffered considerable discomfort for more than a week.

Now that biologists are aware of the fact that the short-tailed shrew really has a poisonous bite, attempts will no doubt be made to determine if other species of shrews are similarly equipped to slow down their prey. As Victor H. Cahalane[4] quotes in his excellent book, "Mammals," the population of shrews may be considerably reduced by scientists anxious to discover whether species other than the short-tailed variety have poisonous bites. According to Dr. A. H. Clark[5], the short-tailed shrew is the only mammal known to science, that has a poisonous bite, although other small mammals may have similar, but as yet undiscovered, qualifications for the fray.

It is not at all surprising that nature should have equipped the shrew with the power of easily overcoming its prey, because many species of shrews are very small, and they have such a high metabolic rate that large quantities of food are necessary to maintain them. It is said that the shrew devours its own weight of flesh and other food material *every three hours*, and if deprived of food for as little as one-half hour, they usually die. They are also extremely nervous and "high strung" so that merely holding them in the hand, (a rather hazardous thing to do) or confining them in a small space is likely to cause their death within one-half hour or even sooner.

[1]Anthony, H. E., 1928. Field Book of North American Mammals; G. P. Putnam's Sons.

[2]Pearson, Oliver P., 1942. On the cause and nature of a poisonous action produced by the bite of a shrew. (*Blarina brevicauda*) *J. Mammalogy* 23: 159-166.

[3]Lawrence, Barbara, 1945. Brief comparison of the short-tailed shrew and reptile poisons. *J. Mammalogy* 26:393-396.

[4]Cahalane, Victor H., 1947. Mammals of North America; pp. 119-125; MacMillan Co., New York.

[5]Clark, Austin H., 1948. Animals Alive; pp. 183-184. D. Van Nostrand Co., New York.

# Veterinary Problems in Poultry Production

By W. R. HINSHAW, D.V.M., Ph.D., Davis, California

Probably the highest price ever paid for a turkey was received recently by the owner of the grand champion dressed bird at the Far West Turkey Show, Turlock, California. The price per pound was $30.50 and the total price received for the bird was $732.00. Armour Creameries, Turlock, made the purchase.

The dog has now been added to the growing list of animals which may suffer from *Salmonella pullorum* infection and be thus a potential carrier of this disease to chicken and turkey flocks. Brown, Bruner and Moran (*J. Am. Vet. Med. Assn.* 114:29, 1949) isolated *S. pullorum* from the lungs, liver, heart, and spleen of a female Boxer which was sacrificed after an illness of several weeks during which it had been on a raw egg diet. The authors suggest the possibility of the dog obtaining the infection from eating infected eggs.

Visceral taints or off-flavors, and off-odors can result from improperly handling dressed poultry according to a report by Trelease, Koonz, and Robinson (*U.S. Egg and Poultry Mag.* 54(10):12, 1948). They investigated six common methods of dressing poultry for evisceration and freezing. Best results from a flavor and aroma standpoint were obtained by eviscerating the birds when still warm, ice chilling for three hours, and freezing at minus 20° F. or by ice chilling for three hours after killing and then freezing. Air chilling overnight before eviscerating was unsatisfactory. Likewise freezing of the freshly killed birds for defrosting, evisceration and refreezing later, prove unsatisfactory.

The Nutrition Council of the American Feed Dealers' Association has recently published the following optimum space requirements for hens and pullets:

*Feeding Space.*—A minimum of 32 feet of hopper space for each 100 layers.

*Water Space.*—One eight-gallon waterer or its equivalent should be provided for each 100 layers. If automatic or continuous jet waterers are used, one should be sufficient for 300 layers.

*Floor Space.*—From 300 to 400 square feet per 100 birds should be allowed, when the birds are in continuous confinement. This allows for three to four square feet per bird including the area covered by the roosting pit.

*Roost Space.*—A minimum of 50 to 58 feet of roost space is needed for each 100 birds, depending on the size of the bird. This allows six to seven inches of roost each, but in a warm climate heavy birds may require as much as nine inches.

*Nest Space.*—At least 20 individual box-type nests should be furnished for each 100 birds.

Only one insect has been described which, if eaten in large enough numbers, causes poisoning in birds. This is the rose chafer *(Macrodactylus subspinosus)*. It is abundant in eastern United States and in Canada and has been reported as far west as Colorado. It is prevalent from the latter days of May to early July. Chickens eat large numbers of the insects if they are available and 15 to 20 will kill a week-old chick. It takes from 25 to 45 to kill a three-week-old chick. Older birds are more resistant and mature fowls are seldom affected. A fatal reaction usually results in 24 hours or the the bird recovers. The toxic principle is thought to be a neurotoxin which has a direct effect on the heart action.

The symptoms include listlessness, incoördination, convulsions, and retraction of the head and neck over the back. No characteristic lesions are seen on autopsy.

The plan adopted by many poultry raisers, especially commercial operators, to reduce the loss from coccidiosis in their chicks is based on the premise that an attack confers immunity to the infestation. These operators use pens that have been used previously to house coccidiosis diseased chicks—it is known that such chicks start to pass immense numbers of oocysts in from two to six days, after blood is noticed in their intestinal evacuations. Such pens must be moist to maintain a maximum coccidia contamination. Susceptible chicks, two to four weeks of age, are then placed in these pens, and at the same time are treated with sulfonamides—either the insoluble sulfamerazine or sulfamethazine at the rate of one ounce thoroughly mixed with 40 to 60 pounds of mash, or the soluble sodium salts of these sulfas at the rate of one ounce to seven gallons of water. These are the daily amounts for 850 to 1,000 chicks, continued for six days. Then the chicks are moved to clean *dry* floors and kept under sanitary surroundings. This method seems to obviate sudden outbreaks and extensive losses.

# Clinical Reports

## Treatment of Infectious Coryza of Chickens with Sodium Sulfamerazine

A breeder of purebred Bantam chickens returned to his flock 10 birds that had been exhibited in a large poultry show. Shortly after their arrival, the birds became sick, and within a few days many other birds in the flock of 110 showed symptoms of illness.

Various stages of the disease were evident at the time of our first visit. Mildly affected birds sneezed and had a serous nasal and ocular discharge. More seriously affected birds showed facial swelling, mucopurulent nasal and ocular discharge, severe dyspnea and weakness. The appetite in the entire flock was poor. Egg production ceased completely within two weeks after the ten "show birds" were returned to the flock.

Fourteen birds had died before our visit and

**Some of the most serious cases had edema of the face together with nasal and ocular discharge and severe dyspnea and weakness**

examination; which was on the 18th day after the "show birds" were returned to the flock. At least 50% of the remaining birds showed symptoms of illness.

Postmortem examination of one bird revealed inflammation of the respiratory tract. There was a film of caseous material throughout the tracheal epithelium, and a caeous plug was found in the larynx. Small colonies which appeared to be *Hemophilus gallinarum* were found on bacteriological culture of this material. Gross lesions in the trachea did not have any resemblance to virus infection. A clinical diagnosis of infectious coryza was made on the basis of the symptoms and macroscopic lesions.

Drinking water containing 0.15% of sodium sulfamerazine* was provided for the entire flock for five days; discontinued for the succeeding three days and then repeated for a second period of five days. Seven birds that were too sick to eat or drink were given one ounce of the medicated water daily by means of a medicine dropper. All died during the period of treatment.

The remainder of the flock recovered. Some of the birds started laying three days after the beginning of treatment with sodium sulfamerazine in the drinking water. Egg production had almost returned to normal by the time therapy was discontinued. It is my opinion, and that of the owner of the birds, that the sodium sulfamerazine in 0.15% concentration was definitely beneficial in checking the losses in the flock and speeding recovery of the affected birds.

SAMUEL B. GUSS, V.M.D.
Lynchburg, Va.

*Sodium Sulfamerazine was supplied through the courtesy of Dr. S. F. Scheidy, Medical Research Division, Sharp and Dohme, Inc.

## Fifty Years a Castrator

Since I castrated my first colt in 1898 I have now performed this operation over a period of 50 years and I am retiring as of this year. The reader will get a general idea of the reason why, from the following story:

Recently I told a client "Well that's the last colt I'll ever castrate for you."

"Why Doc"?

"Well I'm not so spry as I used to be and with some of the help I have here in the mountains, it is just not safe any more. I'm quitting."

"No Doc you aint as spry as you used to be, *and you never was.*"

I haven't castrated many colts. I compute the number to be right at 800 in 50 years. When I began, many veterinarians were castrating one-half that number every year. What in my opinion makes it worth recording is the fact that I have never lost a horse as a direct or indirect result of the operation!

Luck of course played a part in this record, which I haven't quite equaled in either bulls or boars. But the main factor I believe was just being careful. I never operated when there was colt distemper on the farm or adjoining farms. I never did the standing operation although sometimes when time was precious and the help poor I was sorely tempted. Nevertheless I took the time to lay them down and make a careful examination before making an incision. And I never let the animal

up until I knew the hemorrhage was arrested and that the structures were normal, or sutured if the ring opening was too large.

Years ago this operation was universally performed without anesthesia. Later I have

I always took time to lay them down

used only local anesthetics and they serve well enough, if they are used right. I never use chloroform for laying a horse down. I once heard a farmer say of it, "It's an easy way to get 'em down, but sometimes darned hard to get 'em up again." That expresses my notion of chloral hydrate anesthesia also.

REMBRANDT MORGAN, D.V.S.
Winfield, W. Va.

## Treatment of Canine and Feline Fungus Infections

The phenolic substance bis (5-chloro-2-hydroxyphenol) methane commonly known as compound G-4* has been studied by Sweatman[1] for the treatment of bovine ringworm. In view of his good results, a trial on fungus infections of small animals seemed to be indicated. The drug was supplied in two forms or bases, *viz.* a 2% vanishing cream base and a 2% ointment in a petrolatum base. The difference is that on fresh, sensitive areas the cream base is best as it spreads easily and evenly. The petrolatum base is used as healing becomes evident.

For some time we have realized that there are very few drugs which can be used on so-called "ringworm cases" with good results. We have used iodine, salicylic acid, aniline dyes, phenols, etc. and in most cases the results were poor, tissue damage was great and the condition failed to clear up completely. In many cases, the drugs themselves caused a contact dermatitis from overmedication which had to be treated with bland medicaments for relief.

Before considering treatment, we should firmly establish a diagnosis and demonstrate the Microsporon, Achorion, or Trichophyton in order to insure proper therapy. It is a common complaint of breeders, especially feline breeders, that when a cat is presented to a veterinarian for some skin condition—a diagnosis of ringworm is made without definite evidence. The use of "black light" as a means of diagnosis is not satisfactory and presents fallacies in that several fungi will fluoresce. The use of ultraviolet light and a Wood's filter will cause vaseline to fluoresce with a bluish-white color. The Wood's filter will not detect Trichophyton. I have examined cats under this light which gave a marked fluorescence only to find that a fluorescent tyrothricin ointment had been used on the areas.

The only accurate method of diagnosis consists of skin scrapings along with culture growths (performed by any clinical laboratory). When skin scrapings are negative, a sample is placed on specially prepared agar and sent to the laboratory for diagnosis. Once the diagnosis of fungus infection is established, treatment with G-4 appears to be a specific therapeutic measure.

*Case No. EO 7498,* Outcase.—A male Collie, 2½ years of age, had developed denuded areas over the frontal bone about one-half inch in diameter. Originally there were three such areas which finally coalesced to form a large, irregularly shaped area. This case had been treated with tincture of iodine on the advice of another veterinarian. Skin scrapings were taken from the periphery of the lesion and the fungus readily demonstrated. The owner was given three ounces of 2% G-4 in a vanishing cream base and advised to spread it on, once daily and report each week. The lesion lost its shiny appearance after six days of therapy and a new growth of hair began to show on the 16th day of treatment.

*Case No. PB 7537,* Outcase.—A pair of Collies, bitch and puppy were presented for euthanasia with the history that the two-year-old son of the owners had developed "ringworm" as diagnosed by a dermatologist and specifically that this ringworm was of animal origin. Both dogs were examined carefully and no lesions were found. I refused to perform the euthanasia and advised them to isolate the dogs from the child and use the compound on the dogs, if they noticed any lesions develop. Two weeks later, the owners returned for more medication. The dogs had not broken out, but since the parents were making no progress with the line of medication given to them by the dermatologist, they had used this ointment on their child with astounding

*Trademark product of the Sindar Corporation, New York City, N. Y., through whose courtesy "G-4" was made available to the writer for experimental use.

[1]Sweatman, John C., 1947. Clinical manifestations and treatment of bovine ringworm. *Cornell Vet.*, 37:3 (January).

results. Four days after medication was instituted, the lesion on the head showed retrogression and the "ugly-look" disappeared. Complete healing occurred after five weeks of medication.

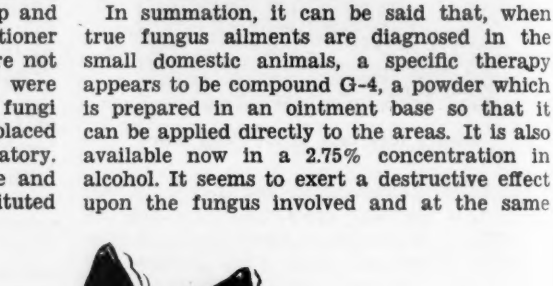
*Case No. RN 7642,* Incase.—A cat was presented with a history of having had an "eczema" for about two months which had cleared partially with treatment, but had at no time completely disappeared. What worried the owner was that his 18-month-old son had developed a skin lesion of the scalp and was under treatment by a general practitioner for impetigo. The lesions of the cat were not round or circular in appearance and were very raw. Scrapings were taken and no fungi could be demonstrated, so a sample was placed on glucose agar and sent to the laboratory. A diagnosis of trichophytosis was made and treatment with the compound was instituted twice daily with ultraviolet therapy. Improvement was noticed in five days and the animal was discharged in 19 days with hair growing in the area.

*Case No. MN 7658,* Incase.—Four puppies were presented with the history that they had developed a "milk rash" after they had been weaned from their mother. They were seven weeks of age and had areas over the face, head, shoulders, and hind legs which were completely bare and had a leathery-like appearance. The owner (a breeder) definitely knew that "it was a milk rash" and treated the areas with a sulfur-limewater-oil base, home remedy. Scrapings were negative and the laboratory report was negative. The phenolic substance was used along with a high protein diet. The animals were in the hospital for six weeks and were discharged at that time as cured of an "obscure dermatosis."

Other cases have been treated with this substance but no complete records were kept although in most cases the owners reported by telephone that recovery had begun or was complete. In one case, the owner used the preparation with excellent results on his cat and had then used the ointment on his own "athlete's foot" because "horse doctor medicine used to give him relief from arthritis and this stuff couldn't hurt him". He reported his recovery was quicker than that of the cat.

A friend had developed a very severe case of epidermophytosis of the toes and sole of the foot and had been treated by a physician who used Castellani's paint which gave temporary relief along with rigid instructions as to habits of cleanliness that must be followed in order to effect a cure. After a course of treatment 10 weeks in length I gave her two ounces of the compound in a petrolatum base which was spread on the area daily and covered with muslin. Marked relief was experienced in three days. The woman ran out of the ointment on the eighth day with almost complete cure in sight. More ointment was not obtainable at that time so that the case is still pending.

In summation, it can be said that, when true fungus ailments are diagnosed in the small domestic animals, a specific therapy appears to be compound G-4, a powder which is prepared in an ointment base so that it can be applied directly to the areas. It is also available now in a 2.75% concentration in alcohol. It seems to exert a destructive effect upon the fungus involved and at the same time to promote healing of the tissues, which have been irritated and inflammed. This apparent action of healing tissues, while destroying the fungus, differs markedly from the therapy used up to now. Cases have been cleared in as short a time as 10 days but where iodine or other irritant therapy has been employed the case continues much longer. This compound has shown no effects upon mange or eczema other than the phenomenon that a moist eczema will spread more rapidly when it is used.



Some cases thought to be eczema, milk rash, etc., are fungus irritations

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Hatboro, Penna.

# Abstract

## False Types and Trends in Cattle Breeding

Many types of cattle which have excessively developed in the direction of a great milk production fail at the first serious life-test: the birth of the first calf and the start of the first lactation period. Some types are so developed in the milk direction that they must bear an udder that is too heavy, a uterus that is too large, and a spine that is too weak.

The weaknesses of our milk types are faults.[8] Many of such cows produce only till the age of five or six years. Nevertheless, the milk and meat production may still be increased, if all the problems in connection with the trend of achieving types in cattle breeding are considered.—J. J. MEIER.

## Anthelmintic Dosage of Arecoline

A total of 157 dogs, ranging in weight from 5½ to 62 pounds were given 0.5ml (or in some cases 1.0ml) of fresh scolices of the *Echinococcus granulosus*[9]. Seven to 10 weeks later they were dosed with arecoline hydrobromide after 24 hours starvation. The worms passed in the feces or vomitus were counted. The following day the dogs were killed to determine the number of worms remaining in the intestine.

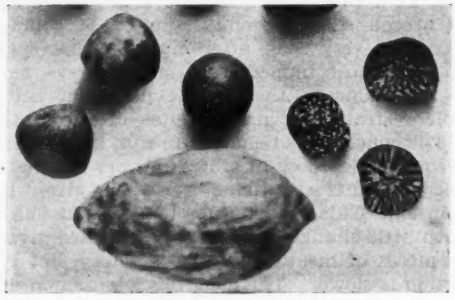
In 11 of the dogs no worms became established. These have been excluded in consideration of the anthelmintic efficiency, as were 16 dogs harboring less than five adult worms, and all the dogs which failed to pass liquid feces after dosing.

Of the 146 artificially infected dogs, two-thirds harbored more than 100 worms, 10 dogs more than 10,000 worms and one dog 19,000 worms.

One group of 46 dogs was given, in solution, a dose of ⅛ grain arecoline hydrobromide, in solution, per 10 pounds body weight. Smaller groups were given smaller and larger doses ranging from 1/64 grain per 10 pounds to two grains per 10 pounds. Further groups were given tablets concealed in pieces of meat (⅛ grain/10 lb.) and subcutaneous injections (⅛ grain/10 lb.)

Doses of 1/64 grain per 10 pounds body weight were unsatisfactory and failed, in most cases, to cause purgation. Doses of 1/32 grain per 10 pounds and over, caused purgation in about 90% of dogs and gave an efficiency of not less than 95%. Increasing the dose above 1/16 grain per 10 pounds, did not materially increase the efficiency, but caused a greater proportion of the dogs to vomit. Increased above ¼ grain per 10 pounds, it caused extreme discomfort and, in some cases, convulsions. None of the dogs was killed, although one animal received 33, ¼ grain tablets.

In 16 animals, tablets concealed in meat removed 94% of worms as compared with 97.5% for the same dose given in solution. The time taken for purgation to occur was significantly longer, than from the same dose in solution; the mean time after dosing being



**ARECA NUT**
**Above, hulled; below, in the husk; right, sliced**

75 plus or minus 8.5 minutes as compared with 25 plus or minus three minutes. A further four animals which failed to purge were excluded from the trial. Giving arecoline in meat is recommended only where dosing is difficult.

Subcutaneous injections cause purgation but had practically no effect in the worms—0.1% expelled.

A further 16 infestations were treated repeatedly with ⅛ grain per 10 pounds to determine the number of doses required to remove 100% of the worms present. In most instances, only a few worms remained after a single dose, though some marked exceptions were observed. Fecal examinations were usually negative after three doses, which caused purgation, but in some instances a few worms remained even after five doses.

The efficiencies recorded against other parasites were: large tapeworms (Taenia, Multiceps and Dipylidium 90-100%; Toxacara, 50%; Uncinaria, nil.)

The paper concludes with an account of *in vitro* experiments using single proglottids of Taenia spp., the contractions of which were recorded on a revolving drum. Prolonged relaxation followed the addition of 0.001% arecoline hydrobromide to the Ringer's solu-

[8]Wille, R. Ueber die Paratypen des Rindes und die Typenideologie der Rinderzucht. Ein Beitrag zur konstitutionsfrage. *Tierarztl Umschau*, (April) 1948.

[9]Bathaur, E. J., 1947. Testing arecoline hydrobromide as an anthelmintic for hydatid worms in Dogs. *Parasitology* 37:185-191. *Abst. in Australian Vet-J* (January) 1948.

tion in which the proplottids were suspended. The segments were not killed by the arecoline, but resumed rhythmical contractions and continued them up to 24 hours after the tests.

Arecoline apparently exerts its anthelmintic action, firstly by causing the parasites to relax and, secondly, by causing purgation which removes them from the alimentary tract.

The fact that arecoline produces only temporary effects on cestodes, stresses the importance of ensuring that adequate purgation is obtained. In this series, 17 of the 151 dogs given doses in solution of 1/32-⅛ grain per 10 pounds failed to purge. In such animals re-treatment is essential.

It is also clear from this work that vomiting, as a rule, does not reduce the efficiency of arecoline hydrobromide, unless, of course, it occurs very soon after dosing. Some dogs vomit almost immediately unless prevented, as was done in these experiments, by suitable restraint for five minutes after dosing.

The conclusions reached are that the usually recommended dose of 1/16 grain per 10 pound body weight is satisfactory when given in solution. This dose may be halved or doubled with little change in efficiency. Arecoline given in pieces of meat, is also satisfactory, but its action is slower. The drug has a wide margin of safety. The higher dose rates showed toxic symptoms, but no animal was killed.

* * * *

## Sterility in the Cow

Fertility in domestic animals depends on the completion of six successive phases, namely, coitus, fertilization, imbedding of the egg in the uterine mucosa, gestation, parturition and lactation.[8] Disruption at any one point can cause sterility.

The humoral mechanism causing estrus and the changes in the female genital tract is then described.

Physiological states misconstrued as evidence of sterility are anestrus of gestation, anestrus of winter and silent heat periods, or "subestrus."

The herdsman recognizes two types of sterility, lack of estrus, and presence of estrus but no progeny. However, from an etiological point of view, sterility is due to organic or functional disease. It may be sporadic or enzootic, irreversible or temporary.

Organic causes of anestrus can be due to congenital absence of the ovaries, free-martinism, infantile genitalia, chronic infections or tumors of both ovaries, or persistant corpus luteum. Functional causes of the absence of heat can be due to inbreeding too fine, retarded puberty, twinning, lack of "sex appeal" of the bull for the cow, dysfunction of the neurohormonal mechanism and nutrition.

Nutritional sterility may be due to underfeeding, over feeding, or imbalance of the proper ingredients of the ration. Underfeeding or inanition is seen especially during wars. Overfeeding may cause obesity which can interfere mechanically with breeding. Protein and mineral feeding is important and sterility can be caused by over or under feeding of these constituents. Vitamins A and E are also essential.

Females shipped to a strange climate are often sterile until they are acclimatized. Excessive milking may sometime cause sterility.

The absence of conception or lack of fertilization is the second prolific cause of sterility. In this case, normal or abnormal estrus occurs, but conception does not take place; or, if conception occurs, the embryo does not become attached to the endometrium and perishes.

Abnormal heat may be seen as alterations in the rhythm or the duration. Improper luteinization will decrease the time between heat periods while too little folliculin will shorten the duration of estrus.

Nymphomania is the continuance of estrus beyond the normal time limit and may become permanent due to psychic changes. "Virilism" or masculinization of the female is another cause of abnormal estrus and may be similar symptomatically to nymphomania.

Absence of conception can be due also to improper insemination, or nonfertilization of the egg. These may be due to abnormalities or infections of the female genital tract.

The nonimplantation of the fertilized egg in the endometrium can be due to the inability of the egg to migrate to the uterus, or improper preparation of the uterine bed. The latter can be due to improper hormonal stimulation or avitaminosis A or E.

The specific diseases which can cause sterility are brucellosis, catarrhal granular vaginitis and trichomoniasis. The latter may be manifested as a vaginitis, endometritis, pyometra or abortion.

Therapy in all the above conditions and diseases depends on the condition encountered. Stilbestrol is used frequently in the hormonal disturbances. The proper supplements will improve cases of sterility due to faulty nutrition. Granular vaginitis is easily cured in three to four weeks with the proper caustics. Trichomoniasis may regress spontaneously or can be treated by suspending mating and applying iodized water locally.

In the treatment of any case of sterility, however, all the above factors must be considered, especially when dealing with a herd.

[8] Lesbouries, G., 1948. Stérilité de la vache (Sterility of the cow) *Rec. de Méd. Vét.* 124:385-411. Abst. by E. B.

The author cautions that artificial insemination is not the answer to sterility since the six factors mentioned still must be taken into consideration, and at best artificial insemination can effect but the first two.

## Rabies a Septicemia?

Rabies has long been regarded as a strictly neurotropic disease; one that from inoculation to denoument involved only nerve tissue—including directly both the peripheral nerves and the central nervous system.

A report of Koprowski and Cox[15] raises the suggestion that this strict limitation upon the adaptability of the rabies virus may have been generally accepted without adequate proof. In studies of the virus in chick embryos they found it distributed throughout the tissues with no special concentration in nerve tissue. This of course suggested a distribution by the blood stream, *i.e.* a septicemia, which was confirmed by successful intracerebral inoculation of mice with embryo blood.

This by no means demonstrates, that in naturally occurring rabies in mammals, the blood stream is invaded by the virus. It does, however, raise the question if such may be the case, and the possibility of modifying a number of conceptions concerning this much studied disease.

[15]Koprowski, H. and Cox, H. R. 1948. Occurrence of rabies in the blood of developing chick embryos. *Proc. Soc. Exp. Biol. & Med.*, 68:512, (July, August).

## New Vaccine Against Brucellosis

Brucella M vaccine is a mucoid growth phase of *Brucella suis*. Huddleson and Bennett[16] state they noted in an investigation that when injected into guinea pigs it produced a higher degree of immunity against all three types of Brucella organisms than others tested.

Thus started the development of a vaccine that has received more attention and been tested in a greater number of herds than any other, since the discovery of strain 19.

It was first demonstrated to be innocuous to guinea pigs, then to be incapable of inducing abortion in pregnant heifers when large numbers of the organisms were injected subcutaneously at any stage of gestation.

The test of the immunizing value of this strain of Brucella was novel if not unique. A cattle housing shortage prevented the use of a sufficient number of animals to conduct a controlled experiment; an equal number of vaccinated and unvaccinated animals all subjected to the same exposure under identical conditions. As a substitute, 24 private herds containing many negative cows and in which Brucella infection had recently appeared were selected. All animals negative to the agglutination test were vaccinated; the infected animals were left in the herd and many abortions occurred, but the uninfected vaccinated animals were protected. After observation for a period of 14 months field trials by many veterinary practitioners were undertaken and are still, after two years, in progress.

Preliminary tests indicate: (1) brucellosis M vaccine confers an immunity equal to that induced by strain 19 vaccine, (2) it is at least equally innocuous to cattle, (3) unbred heifers lose their positive reaction within 90 days after vaccination with brucellosis M, and (4) mature animals can be vaccinated with it without making them permanent reactors. The dairymen want a thorough official test of this vaccine.

[16]Huddleson, I. Forest and Bennett, R. G. 1948. The vaccinal immunizing value of a mucoid phase of *Brucella suis* against brucellosis in cattle. Article 31-14 *Mich. Agr. Exp. Sta. Quarterly*, 31:139-156 (November).

## Substitute for Shaving Operative Sites

Pitesky and Lash, researchers at the University of Illinois Medical School offer the following formula[17] for a depilatory:

Purified yellow barium sulfide..... 50gm
Tide (or dreft or swerl)..... 25gm
Glycerine solution (10% in water)....150cc
Triturate the barium sulfide and the detergent together; then add the glycerine solution and stir until a smooth suspension is obtained.

The entire under-surface of the abdomen and chest of a large rabit can be denuded with this depilatory in five minutes—leaving the skin smooth and nonirritated.

The directions for use are: Wet the hair with water thoroughly on the area to be denuded. Apply the depilatory with a wooden applicator (tongue depressor) working it gently into the hair. As the depilitating action becomes slower the depilatory should be worked gently, back and forth over the area as it becomes dry sprinkle with water. When the hair is completely gelatinized the area is rinsed with copious amounts of water to remove the detritus.

A depilatory of such efficacy must have occasional uses in veterinary practice *e.g.* when the clippers have been forgotten or the razor is dull; when the animal resents clipping and at other times. The authors prefer the use of this depilatory to shaving or clipping for all laboratory animals including dogs, cats and monkeys.

[17]Pitesky, Isadore and Lash, Jules H. 1948. An effective depilatory formula for use on laboratory animals. *Science* 108:657, (December 12).

# Book Reviews

*Manual of Clinical Laboratory Methods.*—By *Opal E. Hepler,* Ph.D., M.D. Associate Professor of Pathology, Northwestern University Medical School, Director of the Clinical Laboratories of the Montgomery Ward Clinics and Passavant Memorial Hospital, Consultant in Clinical Pathology at Children's Memorial Hospital, Chicago. With a foreword by *James P. Simonds,* Ph.D., M.D. Fourth edition, rearranged, revised and enlarged, 387 large pages, many illustrations including five full-page color plates. Published by Charles C. Thomas, Springfield, Ill., 1949. Price $8.50

This manual of laboratory procedures is the outgrowth of an extraordinary amount of experience in laboratory direction. Even in planograph form, without advertising or any review in medical journals, we are told its use extended to many hospitals and schools throughout the United States and the demand was such as to require several editions.

Explicit, step by step directions are given for the performance of laboratory tests. The pattern of the discussion is (1) principles of the test, (2) steps of the test in sequence, (3) determination of the result and (4) interpretation. Is weakness for veterinary use lies chiefly in the latter since the work comprehends only diseases of human kind, though naturally most tests apply to pathological processes, rather than to specific diseases and are largely applicable to the diseases of both man and animals. The directions for making laboratory tests have never been given more understandably.

* * * *

*Bob Vincent Veterinarian.* By *Edna Hoffman Evans.* Illustrated by *Bernice Oehler.* 192 pages. Published by E. P. Dutton & Co. Inc. Price $2.50.

This is the fifth work of fiction published in recent years in which a veterinary hospital is the locale about which the plot is constructed or a veterinarian is the central theme in the story; the others being "Dutch Vet," "Pattern for Penelope," "Crossroads for Penelope" and "Stallion Road."

In "Bob Vincent Veterinarian," the story develops much as it does in the Penelope stories, particularly in the first one. Bob Vincent, a teenager in his last year in high school, becomes acquainted with "Doctor Bean" through taking his injured dog to the local veterinary hospital for treatment and is employed by the veterinarian during his summer vacation.

Doctor Bean is a general practitioner and as his assistant Bob's experiences course through a wide range of veterinary services and include both exciting and humorous adventures.

By industry, study, natural aptitude and a love of animals he acquits himself with credit and, finally, during the doctor's absence, by giving intelligent first-aid to three pets suffering from strychnine poisoning, he wins the rarely bestowed approbation of their owner, an aged, eccentric, wealthy widow, who supplies him with funds with which to attend a veterinary college.

It is preeminently a boy's story—a story of a boy's adventures with animals and with engaging but also with despicable persons.

With only one or two exceptions, the author uses her veterinary nomenclature correctly—a rare achievement among lay writers. The cases described and treatment recounted also are reasonable ones. The portrayal of veterinary practice is accurate and most friendly. It is a work that the thousands seeking admittance to veterinary colleges can read with profit. While veterinary practice is painted in attractive colors, there is no blinking the fact it embodies hard work and much of it. It is well suited to the waiting room table in animal hospitals.

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## Bulletins, Circulars, Reprints

*Studies of the Histopathology of Acute Laminitis.*—A 95-page monograph (in English) on acute laminitis. Almqvist & Wiwsells, Uppsalla, Sweden.

*Increasing the Security of the U.S. from F. & M. Disease through Research.*—Bureau of Animal Industry, USDA., Washington 25, D.C.

*Control of Foot-and-Mouth Disease.*—A factual account of the outbreak of the disease in Mexico to December, 1948. U. S. Government Printing Office, Washington, D.C.

*Studies in Anaplasmosis II.*—A report of research on anaplasmosis over a number of years at the Kansas station. A review of the literature is included. Kansas Agr. Exp. Sta., Manhattan.

*Report of the Chief of the Bureau of Animal Industry.*—Report for the fiscal year ending June 30, 1948. Supt. of Documents, U. S. Government Printing Office, Washington, D.C., price 20 cents.

*Two New Parasiticides.*—Reprint of a discussion of benzene hexachloride (666, gammexane, hexachlorocyclohexane) and sodium fluoride from the *M.S.C. Vet.* by Philip A. Hawkins,, M.A., D.V.M., Michigan State College, East Lansing.

*Huddleson Brucellosis Vaccine.*—The vaccinal immunizing value of a mucoid-growth phase of *Brucella suis* against brucellosis in cattle by I. Forrest Huddleson and G. R. Bennett. Article 31-14 (November 1948) Michigan Agr. Exp. Sta. East Lansing.

*Toxicity of Newer Insecticides to Sheep and Cattle.*—Reprint from the *J. of Economic Entomol.* (41:36) of a record of tests of DDT, chlordane, benzene hexachloride and methoxy analog of DDT by Howard Welch, Montana Agr. Exp. Sta., Bozeman.